

JAPANESE

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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[Translation done.]

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CLAIMS

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[Claim(s)]

[Claim 1] Two or more mobile stations, two or more base stations which communicate with two or more of these mobile stations, and the base station controller which has jurisdiction [ base stations / these / two or more ], The trunk connection equipment which sets up an access link among two or more above-mentioned mobile stations, respectively, It is prepared between this trunk connection equipment and connectionless mode packet communication system. It has the gateway unit which communicates by tunneling between the above-mentioned trunk connection equipment. It is the migration communication system which has the function to transmit the multicast packet transmitted from the terminal with which the above-mentioned connectionless mode packet communication system is equipped to two or more mobile stations through the above-mentioned access link. The above-mentioned trunk connection equipment by reproducing the above-mentioned multicast packet A means to create a number equivalent to the number of the mobile stations (henceforth a "distribution place mobile station") by which distribution registration was carried out of multicast packets, Migration communication system characterized by being a thing including a means to distribute this created multicast packet through the above-mentioned access link to the above-mentioned distribution place mobile station.

[Claim 2] It is the migration communication system characterized by being a thing including a means to require distribution registration of a multicast packet of the above-mentioned trunk connection equipment through a control channel with location registration or a handover when the above-mentioned mobile station moves with modification of \*\* area area in claim 1.

[Claim 3] As opposed to the mobile station which has moved the above-mentioned base station to the cel which a local station forms in claims 1 or 2 It is a thing including a means to report the information about the multicast packet which the local station has distributed through an information channel. The above-mentioned mobile station A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet reported from the above-mentioned base station, Migration communication system characterized by being a thing including a means to require distribution registration of the multicast packet of the request concerned of the above-mentioned trunk connection equipment through the above-mentioned access link when the desired multicast packet was not distributed and it is distinguished.

[Claim 4] In claim 1 thru/or either of 3 the above-mentioned trunk connection equipment A means to distinguish whether the multicast packet corresponding to the demand concerned is distributed when more than one are prepared for every predetermined area and distribution registration is required from the above-mentioned mobile station, When the multicast packet corresponding to the above-mentioned demand was not distributed and it is distinguished It is what includes further a means to require distribution registration of a multicast packet from the above-mentioned gateway unit. The above-mentioned gateway unit Migration communication system characterized by being a thing including a means to distribute the multicast packet corresponding to the demand concerned to the trunk connection equipment which has carried out the demand concerned when there is a distribution registration demand from the above-mentioned trunk connection equipment.

[Claim 5] In claim 1 thru/or either of 4 the migration communication system concerned It is what makes CDMA (Code Division Multiple Access) a telecommunications access method. The above-mentioned base station controller The means which assigns common wireless resource information to two or more above-mentioned mobile stations, It is a thing including a means to notify that a multicast packet is distributed based on this assigned wireless resource information to each base station of the above-mentioned controlled system. The above-mentioned base station Migration communication system characterized by being a thing including a means to distribute a multicast packet to a mobile station based on the above-mentioned wireless resource information when the above-mentioned notice is received from the above-mentioned base station controller.

[Claim 6] In claim 1 thru/or either of 5 the above-mentioned trunk connection equipment When the above-mentioned mobile station changes the jurisdiction area of the above-mentioned base station controller, it is what includes further a means to notify that a circuit is secured by subscriber line extension control to each above-mentioned base station controller in the base station controller immediately after modification from the base station controller in front of modification. The above-mentioned base station controller Migration communication system characterized by being a thing including a means to secure a circuit by performing subscriber line extension control based on the notice of the above-mentioned trunk connection equipment.

[Claim 7] In claim 1 thru/or either of 6 the above-mentioned base station controller A means to transmit the question signal which checks the existence of the need for distribution of the above-mentioned multicast packet to a base station, It is a thing including a means to transmit the power measurement indication signal which directs received-power measurement to the above-mentioned base station. The above-mentioned base station A means to transmit the above-mentioned question signal to the above-mentioned mobile station, and a means to measure the received power of the reply signal transmitted from a mobile station when the above-mentioned power measurement indication signal is received, It is a thing including a means to transmit this measured received-power value to the above-mentioned base station controller. The above-mentioned mobile station It is a thing including a means to transmit the reply signal over reception of the above-mentioned question signal to the above-mentioned base station. The above-mentioned base station controller Migration communication system characterized by being what includes further a means to hold the received-power value transmitted from the above-mentioned base station, and a means to control the transmitted power of a base station based on the received-power value by which maintenance is carried out [ above-mentioned ] in case a multicast packet is distributed to a mobile station.

[Claim 8] The mobile station which is a mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link, and is characterized by to include a means require distribution registration of a multicast packet through a control channel with location registration or a handover when moving with modification of \*\* area area.

[Claim 9] It is the mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link. A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet which received, The mobile station characterized by including a means to require distribution registration of the multicast packet of the request concerned when the desired multicast packet was not distributed and it is distinguished.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the migration communication system and the mobile station which have the multicast packet transmission function to transmit one multicast packet sent out to a detail from IP (Internet Protocol) packet communication system to two or more mobile stations more about migration communication system and mobile stations, such as cellular system.

[0002]

[Description of the Prior Art] Conventionally, the wireless circuit of migration communication system is used and the mobile data communication system which transmits a packet from the computer contained in a point-to-point-communication system to the mobile station in migration communication system is known. There are some which realize packet transmission by the so-called tunneling in migration communication system in this mobile data communication system.

[0003] If it explains in full detail more, this migration communication system is performing packet transmission by the above-mentioned tunneling in between the gateway unit which functions as the gate between point-to-point-communication systems, and the support equipment which has jurisdiction [ area / location registration ] in migration communication system. This tunneling transmits a packet on the logical transfer pass (tunnel) established based on the positional information of a mobile station. Thereby, packet transmission to the mobile station which moves is made possible.

[0004] On the other hand, in IP (Internet Protocol) packet communication system represented by internet/intranet, the so-called multicast communication link is performed from the former. A multicast communication link transmits a multicast packet from one computer to two or more computers. There is meeting junction etc. as a use gestalt of a multicast communication link.

[0005] The multicast communication link in IP packet communication system is performed according to the control procedure called IGMP (Internet Group Management Protocol). In IGMP, the transmission place of a multicast packet is managed by the router in IP packet communication system. That is, only the number equivalent to the number of transmission places reproduces a multicast packet, and a router transmits the multicast packet obtained as a result to each transmission place, when two or more transmission places exist.

[0006] By the way, if this multicast communication link can be used in mobile data communication system, for a user, it is very convenient. That is, even if it is a going-out place, it is because he can watch meeting junction etc. Then, a technique of using the multicast communication link in IP packet communication system also in mobile data communication system is desired.

[0007]

[Problem(s) to be Solved by the Invention] However, in having applied the multicast communication link in IP packet communication system to the above mobile data communication system as it was, there is fear which is not enough.

[0008] Then, the purpose of this invention is offering the migration communication system and the mobile station which can aim at improvement in system efficiency, when applying the

multicast communication link in connectionless formal \*\* systems, such as IP packet communication system, to mobile communication.

[0009]

[Means for Solving the Problem] Two or more base stations where this invention for attaining the above-mentioned purpose communicates with two or more mobile stations and two or more of these mobile stations, The base station controller which has jurisdiction [ base stations / these / two or more ], and the trunk connection equipment which sets up an access link among two or more above-mentioned mobile stations, respectively, It is prepared between this trunk connection equipment and connectionless mode packet communication system. It has the gateway unit which communicates by tunneling between the above-mentioned trunk connection equipment. It is the migration communication system which has the function to transmit the multicast packet transmitted from the terminal with which the above-mentioned connectionless mode packet communication system is equipped to two or more mobile stations through the above-mentioned access link. The above-mentioned trunk connection equipment by reproducing the above-mentioned multicast packet A means to create a number equivalent to the number of the mobile stations (henceforth a "distribution place mobile station") by which distribution registration was carried out of multicast packets, It is the migration communication system characterized by being a thing including a means to distribute this created multicast packet through the above-mentioned access link to the above-mentioned distribution place mobile station.

[0010] Moreover, this invention is migration communication system characterized by being a thing including a means to require distribution registration of a multicast packet of the above-mentioned trunk connection equipment through a control channel with location registration or a handover, when the above-mentioned mobile station moves with modification of \*\* area area.

[0011] Furthermore, this invention receives the mobile station which the above-mentioned base station has moved to the cel which a local station forms. It is a thing including a means to report the information about the multicast packet which the local station has distributed through an information channel. A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet to which the above-mentioned mobile station is reported from the above-mentioned base station, When the desired multicast packet was not distributed and it is distinguished, it is the migration communication system characterized by being a thing including a means to require distribution registration of the multicast packet of the request concerned of the above-mentioned trunk connection equipment through the above-mentioned access link.

[0012] A means to distinguish whether this invention has distributed the multicast packet corresponding to the demand concerned when two or more above-mentioned trunk connection equipments are formed for every predetermined area and distribution registration is required from the above-mentioned mobile station further again, When the multicast packet corresponding to the above-mentioned demand was not distributed and it is distinguished It is what includes further a means to require distribution registration of a multicast packet from the above-mentioned gateway unit. When a distribution registration demand has the above-mentioned gateway unit from the above-mentioned trunk connection equipment, it is the migration communication system characterized by being a thing including a means to distribute the multicast packet corresponding to the demand concerned to the trunk connection equipment which has carried out the demand concerned.

[0013] Furthermore, this invention is that to which the migration communication system concerned makes CDMA (Code Division Multiple Access) a telecommunications access method. A means by which the above-mentioned base station controller assigns common wireless resource information to two or more mobile stations, It is a thing including a means to notify that a multicast packet is distributed based on this assigned wireless resource information to each base station of the above-mentioned controlled system. When the above-mentioned base station receives the above-mentioned notice from the above-mentioned base station controller, it is the migration communication system characterized by being a thing including a means to distribute a multicast packet to a mobile station based on the above-mentioned wireless resource

information.

[0014] When the above-mentioned mobile station changes the jurisdiction area of the above-mentioned base station controller, the above-mentioned trunk connection equipment this invention further again It is what includes further a means to notify that a circuit is secured by subscriber line extension control to each above-mentioned base station controller in the base station controller immediately after modification from the base station controller in front of modification. Each above-mentioned base station controller is the migration communication system characterized by being a thing including a means to secure a circuit by answering the notice of the above-mentioned trunk connection equipment, and performing subscriber line extension control.

[0015] Furthermore, a means by which this invention transmits the question signal with which the above-mentioned base station controller checks the existence of the need for distribution of the above-mentioned multicast packet to a base station, It is a thing including a means to transmit the power measurement indication signal which directs received-power measurement to the above-mentioned base station. The above-mentioned base station A means to transmit the above-mentioned question signal to the above-mentioned mobile station, and a means to measure the received power of the reply signal transmitted from a mobile station when the above-mentioned power measurement indication signal is received, It is a thing including a means to transmit this measured received-power value to the above-mentioned base station controller. A means by which the above-mentioned base station controller holds the received-power value transmitted from the above-mentioned base station including a means by which the above-mentioned mobile station transmits the reply signal over reception of the above-mentioned question signal to the above-mentioned base station, In case a multicast packet is distributed to a mobile station, it is the migration communication system characterized by being what includes further a means to control the transmitted power of a base station, based on the received-power value by which maintenance is carried out [ above-mentioned ].

[0016] This invention is the mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link further again, and when moving with modification of \*\* area area, it is the mobile station characterized by to include a means require distribution registration of a multicast packet through a control channel with location registration or a handover.

[0017] Furthermore, this invention is a mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link. A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet which received, When the desired multicast packet was not distributed and it is distinguished, it is the mobile station characterized by including a means to require distribution registration of the multicast packet of the request concerned.

[0018]

[Embodiment of the Invention] Below, the gestalt of implementation of this invention is explained to a detail with reference to an accompanying drawing.

[0019] In addition, the following operation gestalten 1 thru/or 7 may be the structure of a system different, respectively, and may correspond to each function in one system, respectively.

[0020] Gestalt 1. drawing 1 of operation is the block diagram showing the configuration of the mobile data communication system with which the migration communication system concerning the operation gestalt 1 of this invention is applied. This mobile data communication system is equipped with IP (Internet Protocol) packet communication system 1 and the migration communication system 10. This mobile data communication system transmits to coincidence the multi-packet sent out from the IP terminal 2 in IP packet communication system 1 to two or more mobile stations 11 in the migration communication system 10.

[0021] IP — packet communication — a system — one — a connectionless mode — a packet —

— communication system — it is — plurality — IP — a terminal — two — plurality — a router — three — and — a gateway unit — (— GW —) — four — having — \*\*\*\*. The IP terminal 2 consists of a personal computer, a workstation, a server, etc., and mounts IP. A gateway unit 4 functions between IP packet communication system 1 and the migration communication system 10 as the gate by the side of IP packet communication system 1.

[0022] The IP terminal 2 divides and sends out transmit data to two or more packets. Each packet consists of a header unit and data division. A header unit includes the IP address which specifies a mobile station 11, when transmitting transmit data to a mobile station 11. For example, a header unit contains the multicast address which specifies one distribution group containing the unicast address which specifies one mobile station 11, or two or more mobile stations 11. In addition, below, the packet which contains a unicast packet, a call, and a multicast address in a header unit for the packet which contains a unicast address in a header unit is called a multicast packet.

[0023] A router 3 relays the packet sent out from the IP terminal 2. The multicast packet sent out from the router 3 is given to a gateway unit 4. After giving a gateway unit 4 from the IP address of the destination to the packet which was able to give processing of specifying \*\*\*\*\*, it is sent out to the migration communication system 10.

[0024] The migration communication system 10 is equipped with a mobile station 11 and ground equipment 12. CDMA (Code Division Multiple Access) is used for the migration communication system 10 as a telecommunications access method between a mobile station 11 and ground equipment 12. That is, in a mobile station 11 and the base station 13 in ground equipment 12, the primary modulation by predetermined primary modulation techniques, such as QPSK (Quadrature Phase Shift-Keying), is performed to transmit data, and a primary modulating signal is created. Then, the secondary modulation using the diffusion code of each user proper is performed to this created primary modulating signal, and a secondary modulating signal is created. And the electric wave based on this created secondary modulating signal is emitted. Thus, the communication link between a mobile station 11 and ground equipment 12 is attained.

[0025] The mobile station 11 has portable computer terminal 11a and migration machine 11b of a note type personal computer etc. Migration machine 11b consists of telephones in which data communication is possible. Specifically, migration machine 11b consists of a portable telephone, PHS (Personal Handyphone System) telephone, etc. Migration machine 11b is connected to computer terminal 11a at the time of use. In addition, a mobile station 11 is a simple substance and may consist of things in which data communication is possible.

[0026] the ground — equipment — 12 — plurality — a base station — 13 — plurality — a base station controller — 14 — plurality — a support — equipment — 15 — a gateway unit — (— GW —) — 16 — and — a home position — a register — 17 — having — \*\*\*\*. A base station 13 forms the cel which consists of a sector of plurality (three [ for example, ]), and communicates with the mobile station 11 which exists in this cel. A base station controller 14 is connected to two or more base stations 13, and it has jurisdiction [ area / which consists of each cel formed of each connected base station 13 concerned / jurisdiction ].

[0027] Support equipment 15 is formed for every location registration area which is the smallest unit which grasps the location of a mobile station 11. Location registration area consists of two or more cels. Support equipment 15 is connected to the home-position register 17, a gateway unit 16, and all the base station controllers 14 formed in location registration area. Support equipment 15 has the function to set up an access link between mobile stations 11. An access link is a logical channel at the time of the packet transmission between support equipment 15 and a mobile station 11, and a multi-statement is carried out for every QOS (Quality Of Service) class every mobile station 11 again. This access link has functions, such as error control (for example, ARQ; error recovery by automatic resending), according to QOS.

[0028] Support equipment 15 has distribution registration table 15a. Distribution registration table 15a shows the correspondence relation between the access link 11, i.e., a mobile station, and the logical channel for transmitting the multicast packet as which the mobile station 11 concerned is demanding distribution. Support equipment 15 specifies the distribution place mobile station which should distribute a multicast packet by referring to this distribution

registration table 15a. Moreover, support equipment 15 updates the contents of distribution registration table 15a by receiving a demand/discharge of distribution registration from a mobile station 11.

[0029] Registration to distribution registration table 15a is performed by transmitting a distribution registration demand signal to ground equipment 12 from a mobile station 11. Specifically, a mobile station 11 transmits a distribution registration demand signal to a base station 13. A base station 13 transmits a distribution registration demand signal to a base station controller 14. A base station controller 14 transmits the received distribution registration demand signal to support equipment 15. Support equipment 15 matches the mobile station 11 (access link) which has required distribution registration, and the multicast packet which should be distributed, and registers it into distribution registration table 15a.

[0030] The home POSITIONING register 17 memorizes the subscriber data of a mobile station 11. A subscriber data contains the current position and the distribution group table of the subscriber's number of a proper, and a mobile station. A distribution group table shows the correspondence relation between a mobile station 11 and a distribution group.

[0031] The gateway unit 16 is connected to the gateway unit 4 of IP packet communication system 1. Moreover, the gateway unit 16 is connected also to the home-position register 17. A gateway unit 16 functions as the gate by the side of the migration communication system 10 between IP packet communication systems 1. Specifically, a gateway unit 16 carries out routing of the transmission place of the packet sent out from IP packet communication system 1 based on the subscriber data memorized by the home-position register 17.

[0032] A gateway unit 16 and support equipment 15 perform data transmission by the so-called tunneling. When transmitting a multicast packet from a gateway unit 16 to support equipment 15, a gateway unit 16 more specifically forms logical transfer pass (tunnel) between support equipment 15. And a multicast packet is transmitted on this formed transfer pass. Thus, with this operation gestalt 1, a gateway unit 16 and support equipment 15 serve as the starting point of a tunnel, and a terminal point, respectively.

[0033] Drawing 2 is a flow chart which shows processing of support equipment 15. In order to distribute a multicast packet to a mobile station 11, it is necessary to set up an access link between a mobile station 11 and support equipment 15. Then, a mobile station 11 requires a setup of an access link from the support equipment 15 of ground equipment 12 after powering on. Answering this, support equipment 15 sets up an access link between mobile stations 11 (step S1).

[0034] If a multicast packet is sent out from the IP terminal 2 in IP packet communication system 1, the multicast packet concerned will be sent out to the migration communication system 10 through a router 3 and a gateway unit 4.

[0035] The multicast packet sent out from IP packet communication system 1 is received in a gateway unit 16. A gateway unit 16 determines the support equipment 15 which should distribute a multicast packet based on the subscriber data memorized by the multicast address and the home-position register 17 of a multicast packet which were received. Specifically, a gateway unit 16 specifies whether which mobile station 11 is contained in the distribution group corresponding to the multicast address concerned by referring to a distribution group table.

[0036] Furthermore, a gateway unit 16 recognizes the location registration area where the mobile station 11 contained in a distribution group exists based on the current position data contained in a subscriber data. Then, a gateway unit 16 determines the support equipment 15 corresponding to this recognized location registration area as the destination.

[0037] A gateway unit 16 transmits a multicast packet by tunneling to the support equipment 15 determined as the destination. In this case, when two or more support equipments 15 are determined as the destination, only the number of support equipment 15 reproduces a multicast packet, and a gateway unit 16 transmits this duplicate multicast packet to each support equipment 15 by tunneling.

[0038] Support equipment 15 will distinguish whether the received packet is a multicast packet, if a packet is received from a gateway unit 16 (step S2) (step S3). If it is a multicast packet, support equipment 15 specifies the mobile station 11 contained in the group who should



distribute the multicast packet concerned (step S4). Specifically, support equipment 15 specifies the mobile station 11 contained in a distribution group and its distribution group based on the distribution group table memorized by the multicast address contained in the transmitted multicast packet, and the home-position register 17.

[0039] Then, support equipment 15 specifies the mobile station (henceforth a "distribution place mobile station") 11 registered into distribution registration table 15a noting that it wishes to distribute with reference to distribution registration table 15a among the mobile stations 11 by which specification was carried out [ above-mentioned ] (step S5). And support equipment 15 reproduces the received multicast packet, in order to create a number equivalent to the number of the distribution place mobile stations 11 of multicast packets (step S6). That is, reproduction of a multicast packet is performed in the support equipment 15 with which it is the terminal point of the transfer pass for tunneling, and an access link is set up between mobile stations 11.

[0040] Then, each of this reproduced multicast packet is transmitted on an access link to the distribution place mobile station 11 (step S7). Support equipment 15 specifies the base station controller 14 which has jurisdiction [ area / where the distribution place mobile station 11 exists / jurisdiction ], and, specifically, transmits the multicast packet after a duplicate per frame on an access link to the specified base station controller 14 concerned.

[0041] A base station controller 14 is transmitted on an access link to the base station 13 which forms the cel in which the distribution place mobile station 11 exists the transmitted multicast packet. A base station 13 emits the electric wave based on the transmitted multicast packet to a cel. Thereby, a mobile station 11 can receive a multicast packet.

[0042] In addition, in distinction processing of step S3, since it is thought that it is a unicast packet when it is not a multicast packet, support equipment 15 transmits a unicast packet through an access link to the mobile station 11 used as the destination (step S8).

[0043] He is trying to reproduce a multicast packet in the support equipment 15 with which it is the terminal point of the transfer pass at the time of performing the communication link by tunneling between gateway units 16, and the access link of a proper is set up between mobile stations 11 as mentioned above according to this operation gestalt 1.

[0044] Therefore, of course, the inside of IP packet communication system 1 of the multicast packet transmitted is one also in the transmission section between a gateway unit 16 and support equipment 15. Therefore, compared with the case where a multicast packet is reproduced in IP packet communication system 1, a multicast packet can be transmitted efficiently. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0045] Gestalt 2. drawing 3 of operation is a flow chart for explaining distribution registration demand processing of the mobile station 11 in the mobile data communication system with which the migration communication system concerning the operation gestalt 2 of this invention is applied. In the following explanation, drawing 1 is referred to to coincidence.

[0046] This operation gestalt 2 explains the distribution registration demand processing in the case of moving to another location registration area, while a mobile station 11 receives a multicast packet. A mobile station 11 needs to require distribution registration anew from the support equipment 15 which has jurisdiction [ area / of a migration place / location registration ], when carrying out migration which continued location registration area. In this case, a mobile station 11 can consider requiring distribution registration of ground equipment 12 through a communication channel.

[0047] However, there is a possibility of taking time amount until it must start distribution of a multicast packet and distribution of a multicast packet is performed, after ground equipment 12 waits for completion of distribution registration in this case. Then, when a mobile station 11 moves between cels, he combines with this handover demand and is trying for this operation gestalt 2 to require distribution registration in consideration of performing a handover demand using a control channel.

[0048] If it explains in full detail more, a base station controller 14 will always direct offer of information information to all the base stations 13 it has jurisdiction [ base stations ]. Information information includes empty channel information. A base station 13 turns an electric

wave including the received information information to a cel, and is emitting it through an information channel. In this way, it is vacant to the mobile station 11 which moves to a self-cel, and the channel is always told.

[0049] On the other hand, the mobile station 11 is monitoring continuously whether a \*\* area cel is changed, when the multicast packet is received. Specifically, a mobile station 11 detects the quality (for example, receiving level) of a received electric wave (step T1). Moreover, it distinguishes whether the mobile station 11 fell under to the threshold predetermined in this detected quality (step T2). The threshold is set as the value equivalent to minimum receiving quality required for a communication link. If quality falls under to the above-mentioned threshold, since it will be thought that the boundary of a cel has been approached, a mobile station 11 performs carrier sense (step T3). Carrier sense is processing which detects the frequency currently used in the contiguity cel, in order to acquire a good receive state.

[0050] Detection of a frequency distinguishes whether the channel corresponding to this detected frequency is vacant as for the mobile station 11 (step T four). Specifically, a mobile station 11 compares the channel corresponding to the detected frequency with the received empty channel of information information. By the channel corresponding to the detected frequency being vacant, if it is not a channel (NO of step T four), a mobile station 11 will perform carrier sense in step T3 again that another channel should be specified. By on the other hand the channel corresponding to the detected frequency being vacant, if it is a channel (YES of step T four), a handover demand signal will be transmitted through a control channel to the base station 13 of a migration place so that a mobile station 11 may change a communication channel to this empty channel (step T5). As a control channel, CCCH (Common Control Channel) etc. is applicable.

[0051] A handover demand signal contains distribution associated data, as shown in drawing 4. Distribution associated data contains classification data and address data. Classification data specify a demand/cancellation of distribution. Address data specify the IP address (multicast address) which wishes a demand/cancellation of distribution. In addition, a handover demand signal contains message classification data, random access number data, jurisdiction area data, and location registration area data. Message classification data specify a handover demand.

[0052] A base station 13 is transmitted to the base station controller 14 to which the received handover demand signal is connected in the local station. A base station controller 14 will be transmitted to the support equipment 15 to which this handover demand signal is connected in self-equipment, if a handover demand signal is received. Consequently, support equipment 15 receives a handover demand signal.

[0053] Support equipment 15 will recognize the data contained in the handover demand signal concerned, if a handover demand signal is received. If distribution associated data is not contained, support equipment 15 directs a handover to the base station controller 14 which has transmitted the handover demand signal.

[0054] A base station controller 14 directs channel release to the base station 13 of a moved material while directing channel setup to the base station 13 of a migration place according to directions of this handover. In this way, a handover is attained.

[0055] On the other hand, if distribution associated data is contained, support equipment 15 specifies the mobile station 11 which has transmitted the handover demand signal concerned based on any the access links where it has been transmitted to the handover demand signal are. Then, support equipment 15 accesses distribution registration table 15a, and registers the access link corresponding to the mobile station 11 concerned. In this way, distribution registration is attained.

[0056] Thus, according to this operation gestalt 2, the mobile station 11 is demanding distribution registration of a demand and coincidence of a handover through a control channel. Therefore, the increase in efficiency of packet transmission can be attained compared with the case where a distribution registration demand is performed through a communication channel. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0057] Gestalt 3. drawing 5 of operation is a flow chart for explaining distribution registration demand processing of the base station controller 14 in the mobile data communication system

with which the migration communication system concerning the operation gestalt 3 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0058] With the gestalt 2 of the above-mentioned implementation, while receiving a multicast packet, the case where it moves to another location registration area is assumed. On the other hand, with this operation gestalt 3, the case where it moves to another location registration area in the condition of having not received the multicast packet is assumed.

[0059] In such a case, a mobile station 11 needs to require location registration not in a handover but in new location registration area. This location registration demand is usually performed using control channels, such as SCCH. Then, in such a case, in a mobile station 11, it combines with a location registration demand and is made to perform a distribution registration demand.

[0060] Specifically, a mobile station 11 is transmitted to the base station 13 which has jurisdiction [ cel / of a migration place ] for a location registration demand signal. A location registration demand signal contains message classification, user ID, location registration area data, and distribution associated data, as shown in drawing 6 . Message classification specifies requiring location registration. Distribution associated data contains classification data and address data as well as the distribution associated data in the handover demand signal shown in drawing 4 .

[0061] A base station 13 is transmitted to the base station controller 14 to which the received location registration demand signal is connected in the local station. Consequently, a base station controller 14 receives a location registration demand signal (step U1). A base station controller 14 transmits the received location registration demand signal to support equipment 15 (step U2).

[0062] According to a location registration demand, support equipment 15 accesses the home-position register 17, and changes the current position of the mobile station 11 concerned into a new location. Thereby, location registration is attained. Moreover, support equipment 15 accesses distribution registration table 15a, and registers the access link set up between the mobile stations 11 concerned. In this way, distribution registration is attained.

[0063] If location registration and distribution registration are performed, support equipment 15 will transmit the reply signal which shows that location registration and distribution registration were performed to a base station controller 14. A base station controller 14 includes wireless resource information required for distribution of a multicast packet in a reply signal, when a reply signal is received (step U3). Then, a base station controller 14 transmits a reply signal including wireless resource information to a base station 13 (step U4).

[0064] Wireless resource information contains the radio frequency, diffusion code, and sector number which are used for distribution of a multicast packet. In this case, wireless resource information is not assigned according to an individual to a mobile station 11, but is assigned in common to two or more mobile stations 11 which are performing distribution registration about the same multicast packet. the case where other mobile stations 11 which are performing distribution registration of the same multicast packet already exist in the location registration area of a migration place — being concerned — others — the wireless resource information currently used for radio with a mobile station 11 is assigned.

[0065] A base station 13 will perform the transmission control of the wireless section based on the wireless resource information included in this received reply signal, if a reply signal is received. After a base station 13 creates a primary modulating signal based on the frequency contained in wireless resource information and creates a secondary modulating signal based on the diffusion code further contained in wireless resource information, specifically, it emits the electric wave based on a secondary modulating signal to the sector corresponding to the sector number contained in wireless resource information.

[0066] According to this operation gestalt 3, it is made to perform a distribution registration demand through a control channel as mentioned above. Therefore, compared with the case where a distribution registration demand is performed through a communication channel, the mobile data communication system whose system efficiency improved can be offered.

[0067] Moreover, when performing distribution registration of a multicast packet, other mobile stations 11 and common wireless resource information are assigned. Therefore, a deployment of a wireless resource can be aimed at. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0068] Gestalt 4. drawing 7 of operation is a flow chart for explaining distribution registration demand processing of the mobile station 11 in the mobile data communication system with which the migration communication system concerning the operation gestalt 4 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0069] This operation gestalt 4 explains the distribution registration demand processing in the case of moving between cels, while a mobile station 11 receives a multicast packet. When a mobile station 11 moves between cels, it is unknown whether the multicast packet of the same class as the multicast packet under reception is distributed to the cel of a migration place. Therefore, when moving between cels, it is possible to always require distribution registration from ground equipment 12 from a mobile station 11.

[0070] However, when the mobile station 11 contained in the same distribution group already exists in the cel of a migration place with a local station, the multicast packet under reception and the multicast packet of the same class may already be distributed to the cel of a migration place. Then, he is trying for this operation gestalt 4 to require distribution registration from ground equipment 12 in consideration of such time only within the case where the multicast packet under reception in the cel of a migration place is not distributed, from a mobile station 11.

[0071] If it explains in full detail more, the base station 13 will have transmitted the information information signal through an information channel toward a cel, when distributing a multicast packet. This is telling whether it is that the multicast packet which wishes to distribute is distributed to the cel concerned to the mobile station 11 which has moved to the cel concerned.

[0072] As an information channel, BCCH (Broadcast Control Channel) etc. is applicable. In this case, BCCH which can be set is for not reporting information about a system at large [ , such as Network ID, Cel ID, and a logical channel configuration, ], and reporting the information about distribution of a multicast packet.

[0073] An information information signal contains packet related information, as shown in drawing 8 (a). Packet related information contains each data of message classification, information-element length, location registration area, a frequency band, diffusion information, and address information, as shown in drawing 8 (b).

[0074] Message classification data specify the classification of the message transmitted to a mobile station 11. Specifically, what kind of information element or an information-element group specifies whether it is contained in the message transmitted to a mobile station 11. Information-element length specifies the message length transmitted to a mobile station 11. Each data of a frequency band and diffusion information specifies the frequency band and diffusion information about a channel on the direction from which it gets down (base station 13 → mobile station 11). [ for distributing the multicast packet shared between two or more mobile stations 11 ] Address information specifies the information about the multicast packet which is performing current distribution. The information concerned contains the packet ID for identifying address information and the mobile station group (distribution group) which receives a multicast packet.

[0075] In addition, an information information signal contains the BCCH identification information, the transmitted power information, the amount of uphill interference, and CRC (Cyclic Redundancy Check) other than packet related information, as shown in drawing 8 (a).

[0076] It returns to drawing 7 , and a mobile station 11 receives the information information signal transmitted through the information channel from the base station 13 which forms the cel of a migration place, when moving between cels while receiving a multicast packet (step V1). Then, a mobile station 11 checks the packet related information contained in the received information information signal (step V2), and the same multicast packet as the multicast packet which a local station is receiving distinguishes whether it distributes from the base station 13 of a migration place (step V3).

[0077] If it does not distribute (NO of step V3), a mobile station 11 transmits a distribution registration demand signal to a base station 13 (step V4). Distribution registration is attained by transmitting a distribution registration demand signal to support equipment 15 through a base station controller 14 from a base station 13, and updating distribution registration table 15a in support equipment 15 like the case of the above-mentioned operation gestalt 2, after that.

[0078] On the other hand, if it distributes (YES of step V3), a mobile station 11 will not transmit a distribution registration demand signal. However, even if it is this case, the registration situation of distribution registration table 15a before migration shows that the mobile station 11 concerned wishes distribution registration. Therefore, a mobile station 11 can receive succeeding the multicast packet under reception, and the multicast packet of the same class.

[0079] Thus, the mobile station 11 is made to give the demand of distribution registration according to this operation gestalt 4 to ground equipment 12 only within the case where the multicast packet of the same class as the multicast packet which the local station has received is not distributed from the base station 13 of a migration place, in case it moves between cels. Therefore, also when having already distributed, compared with the case where a distribution registration demand is performed, signal processing in ground equipment 12 becomes easy. Therefore, the effectiveness of signal processing can be improved.

[0080] In addition, when requiring distribution registration, you may make it require distribution registration through a control channel like the above-mentioned operation gestalt 2 with a handover demand. In this case, improvement in packet transmission efficiency can be aimed at like the above-mentioned operation gestalt 2.

[0081] Gestalt 5. drawing 9 of operation is a flow chart for explaining the processing at the time of distribution registration of the support equipment 15 in the mobile data communication system with which the migration communication system concerning the operation gestalt 5 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0082] This operation gestalt 5 explains processing of support equipment 15 in case distribution registration has been required from ground equipment 12 from the mobile station 11. A mobile station 11 may move to another location registration area. In this case, since different support equipment 15 and a different communication link will be performed, a mobile station 11 needs to require distribution registration of a multicast packet anew.

[0083] When the mobile station which wishes distribution of the multicast packet of the same class as a local station exists in the location registration area of a migration place, a mobile station 11 only performs the above-mentioned distribution registration demand, and can receive a desired multicast packet. That is, it is because the desired multicast packet is already distributed in the cel of a migration place.

[0084] When the mobile station 11 which, on the other hand, wishes distribution of the multicast packet of the same class as a local station does not exist in the location registration area of a migration place, the gateway unit 16 has not transmitted the multicast packet to the support equipment 15 which has jurisdiction [ area / concerned / location registration ]. Therefore, the multicast packet will be distributed to any cel in the location registration area concerned. Therefore, even if support equipment 15 receives distribution registration from a mobile station 11, it cannot distribute the multicast packet according to a distribution demand to a mobile station 11.

[0085] Then, the distribution situation of a multicast packet is investigated in support equipment 15, and it enables it to distribute a multicast packet to a mobile station 11 in consideration of such a case with this operation gestalt 5.

[0086] When explaining in full detail more and the distribution registration demand signal from a mobile station 11 is received (step W1), support equipment 15 distinguishes whether the multicast packet according to a demand is distributed. Specifically, support equipment 15 checks the multicast packet which the mobile station 11 is demanding based on the address data contained in distribution associated data (step W2). Subsequently, the mobile station 11 with which support equipment 15 has required distribution registration distinguishes whether it registers with distribution registration table 15a (step W3).

[0087] If registered (YES of step W3), the mobile station 11 will not have moved from another location registration area, and it will be thought that distribution registration is newly required in the same location registration area. Therefore, support equipment 15 registers the mobile station 11 concerned into distribution registration table 15a in this case as usual. Consequently, a mobile station 11 can receive the multicast packet distributed from support equipment 15. On the other hand, if not registered (NO of step W3), support equipment 15 registers into distribution registration table 15a the mobile station 11 which has required distribution registration (step W4).

[0088] Next, it distinguishes whether support equipment 15 has distributed the multicast packet corresponding to the distribution registration demand concerned (step W5). If the multicast packet is distributed (YES of step W5), support equipment 15 will be transmitted to a base station controller 14 that the multicast packet distributed should be distributed to the mobile station 11 which has required distribution registration. On the other hand, if the multicast packet is not distributed (NO of step W5), support equipment 15 is required from a gateway unit 16 so that the multicast packet concerned may be distributed (step W6).

[0089] If a distribution demand is carried out from support equipment 15, a gateway unit 16 will reproduce the multicast packet according to a demand, and will transmit the reproduced multicast packet to the support equipment 15 which has carried out the distribution demand. Thereby, support equipment 15 can distribute the multicast packet according to a demand to the mobile station 11 which has required distribution registration.

[0090] Thus, according to this operation gestalt 5, when there is a distribution registration demand of a multicast packet from a mobile station 11, support equipment 15 requires distribution of a multicast packet from a gateway unit 16, whenever it has not received distribution of a multicast packet from a gateway unit 16.

[0091] Therefore, compared with the case where a multicast packet is beforehand distributed from a gateway unit 16 to all the support equipments 15, processing in a gateway unit 16 and support equipment 15 can be simplified supposing this case. Therefore, it can consider as the mobile data communication system whose processing effectiveness improved.

[0092] Gestalt 6. drawing 10 of operation is a flow chart for explaining the processing at the time of distribution registration of the support equipment 15 in the mobile data communication system with which the migration communication system concerning the operation gestalt 6 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0093] With this operation gestalt 6, when a mobile station 11 moves between cels while receiving a multicast packet and distribution registration has been required from the mobile station 11, the subscriber line extension control performed in support equipment 15 and a base station controller 14 is explained. When a mobile station 11 moves between cels while receiving a multicast packet, it is possible to only perform a setup and release of a circuit by the handover. However, although it is an instant, since a circuit is severed in this case, there is a possibility that a packet loss may occur. So, with this operation gestalt 6, the subscriber line extension control to which the hits of the circuit are not carried out has realized the channel change.

[0094] If it explains in full detail more, a mobile station 11 will transmit a distribution registration demand signal to a base station 13, when moving between cels. A base station 13 transmits the received distribution registration demand signal to a base station controller 14. A base station controller 14 transmits the received distribution registration demand signal to support equipment 15. Consequently, support equipment 15 receives a distribution registration demand signal (step X1).

[0095] Support equipment 15 distinguishes whether the base station controller 14 which has transmitted the distribution registration demand signal differs from the base station controller 14 which had distributed the multicast packet before migration to the mobile station 11 concerned (step X2). If it differs (NO of step X2), it will distinguish whether support equipment 15 is the distribution demand of the multicast packet of the same class as the multicast packet distributed from the base station 13 of a moved material to the mobile station 11 concerned (step X3). When it is the multicast packet of the same class, support equipment 15 performs

subscriber line extension control for circuit reservation (step X4).

[0096] Specifically, it is required that support equipment 15 should connect a circuit between the base station controllers 14 of a moved material to the base station controller 14 of a migration place. Moreover, it is required that support equipment 15 should connect a circuit between the base station controllers 14 of a migration place also to the base station controller 14 of a moved material. Two base station controllers 14 of which the line connection was required establish a circuit mutually according to this demand from support equipment 15. In this way, the line connection by subscriber line extension is attained.

[0097] As for support equipment 15, the usual handover is performed, when the same as the base station controller 14 which had distributed the multicast packet before the base station controller 14 which has transmitted the distribution registration demand moving on the other hand (NO of step X2), and when the multicast packet demanded from the mobile station 11 is not the thing of the same class. That is, while setting up a channel between a mobile station 11 and the base station 13 of a migration place, the channel set up between the mobile station 11 and the base station of a moved material is made to release.

[0098] Thus, according to this operation gestalt 6, since subscriber line extension is performing the line connection, unlike the case where a setup and release of a circuit by the mere handover are performed, a packet loss can be prevented at the time of migration between cels. Therefore, a mobile station 11 can receive a multicast packet continuously. Therefore, a mobile station 11 can receive quality distribution data. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0099] Gestalt 7, drawing 11 and drawing 12 of operation are a flow chart for explaining the transmitted power control processing in the mobile data communication system with which the migration communication system concerning the operation gestalt 7 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0100] It may become unnecessary distributing it, even if the mobile station 11 is carrying out distribution registration. Although this is determined by a user's volition, it does not necessarily perform a distribution registration deletion demand in this case. distribution registration is deleted — distribution — it is useless to continue distributing a multicast packet to the unnecessary mobile station 11, and it is inefficient. Then, he is trying for the ground equipment 12 side to check the existence of the need for distribution periodically in this operation gestalt 7 to the mobile station 11 which is carrying out distribution registration.

[0101] If it furthermore explains in full detail, support equipment 15 will transmit a question signal to a base station controller 14 periodically (step Y1 of drawing 1111 ). A question signal is for checking the existence of the need for distribution to the mobile station 11 registered into distribution registration table 15a. A base station controller 14 will transmit this question signal to a base station 13, if a question signal is received (step Y2). At this time, a base station controller 14 transmits a power measurement-request signal to a base station 13 with a question signal (step Y2). A power measurement-request signal requires measurement of power when the reply signal over a question signal is received in a base station 13.

[0102] A base station 13 will transmit a question signal to each mobile station 11 in a cel between these two received signals, if a question signal and a power measurement-request signal are received (step Y3). A mobile station 11 will transmit the reply signal which is the response to a question signal to a base station 13, if a question signal is received (step Y4).

[0103] A base station 13 will measure the power of the received reply signal based on the received-power measurement signal transmitted to old from the base station controller 14, if a reply signal is received (step Y5). A base station 13 adds the measurement power value concerned to a reply signal after power measurement, and transmits this reply signal to a base station controller 14 (step Y5).

[0104] A base station controller 14 receives the reply signal transmitted from the base station 13. Then, it distinguishes whether it is a thing to a question signal [ as opposed to / base station controller / 14 / which kind of multicast packet in a reply signal ] (step Y6).

[0105] As mentioned above, a question signal is transmitted periodically. Therefore, it always is not necessary to answer a letter to support equipment 15 in the reply signal over the multicast

packet of the same class, and just once is enough as the reply signal over the multicast packet of one class. Therefore, the above distinction processings are performed.

[0106] If it is a reply signal over the multicast packet of a class which received to old (YES of step Y6), a base station controller 14 will not transmit a reply signal to support equipment 15. On the other hand, if it is a reply signal over the multicast packet of a class which received for the first time (NO of step Y6), a base station controller 14 will transmit a reply signal to support equipment 15 (step Y7).

[0107] Support equipment 15 will update the distribution registration situation of distribution registration table 15a according to the contents of a response, if a reply signal is received. When it is a reply signal that there is the need for distribution, specifically, as for support equipment 15, registration of the mobile station 11 concerned is maintained. In being a reply signal that there is no need for distribution, support equipment 15 eliminates registration of the mobile station concerned from distribution registration table 15a.

[0108] A base station controller 14 accumulates the received-power value included in a reply signal every base station 13 again (step Y8 of drawing 1212 ). A base station controller 14 distinguishes whether the reply signal was received from all the base stations 13 connected (step Y9). If a reply signal is received from all the base stations 13, a base station controller 14 will recognize the minimum received-power value among all received-power values (step Y10).

[0109] Then, a base station controller 14 computes the power value at the time of a multicast packet being transmitted from a base station 13 based on the minimum received-power value (step Y11). Specifically, a base station controller 14 computes the transmitted power value to which the minimum received-power value turns into a received-power value defined beforehand from the need of making sufficient received power receiving a multicast packet in a mobile station 11.

[0110] Then, a base station controller 14 is notified to all the base stations 13 connected so that a multicast packet may be distributed with this computed transmitted power value (step Y12). The base station 13 which received this notice distributes a multicast packet with the above-mentioned transmitted power value.

[0111] Thus, according to this operation gestalt 7, in case the existence of the need for distribution is checked, a base station controller 14 collects the received-power values in a base station 13, and is controlling the transmitted power of a base station 13 according to the minimum received-power value among this collected received-power value. Therefore, in all the mobile stations 11 that exist in the jurisdiction area of a base station controller 14, a multicast packet is receivable with sufficient received power. Therefore, quality multicast packet transmission is realizable. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0112] Seven operation gestalten of this invention have been explained more than other operation gestalt . However, of course, this invention can take other operation gestalten. For example, in the above-mentioned operation gestalt 1 thru/or 7, it is explaining taking the case of the case where IP packet communication system is applied as connectionless mode packet communication system. However, this invention is easily applicable also to other connectionless mode packet communication system, such as CLNP (Connection-Less Network Protocol) mold packet communication system.

[0113]

[Effect of the Invention] When applying the multicast packet communication link in connectionless mode packet communication system to migration communication system as mentioned above according to this invention, a multicast packet is reproduced in trunk connection equipment. Therefore, what is necessary is just to transmit one multicast packet, even if two or more distribution place mobile stations exist in connectionless mode packet communication system. And what is necessary is just to transmit one multicast packet between a gateway unit and trunk connection equipment. Therefore, compared with the case where a multicast packet is reproduced and transmitted within connectionless mode packet communication system, a multicast packet can be transmitted efficiently. Therefore, system efficiency can be improved.



[0114] Moreover, according to this invention, when moving with modification of \*\* area area, such as a cel and location registration area, the mobile station is made to perform the distribution demand of a multicast packet with a location registration demand or a handover demand through a control channel. Therefore, compared with the case where a packet distribution demand is performed through a communication channel, a multicast packet can be quickly transmitted to a mobile station. In other words, a mobile station can receive a multicast packet quickly.

[0115] Since a communication channel cannot be used because of packet transmission, it is necessary to make packet transmission stand by, in performing a packet distribution demand through a communication channel, if it explains in full detail more. However, packet transmission can be performed by performing a packet distribution demand not through a communication channel but through a control channel, without waiting for a packet distribution demand. Therefore, a packet can be transmitted efficiently and a packet can be efficiently received in a mobile station.

[0116] Furthermore, according to this invention, from the base station which forms the cel immediately after modification, when a mobile station moves with modification of a \*\* area cel, whenever the desired multicast packet is not distributed, distribution registration is required from the base station concerned. That is, when the multicast packet of the group in whom a local station exists from the base station which forms the cel immediately after modification is distributed, the multicast packet can be received. Therefore, even if a mobile station does not carry out distribution registration at every migration, it can receive a multicast packet. That is, in a mobile station, the increase in efficiency of a distribution registration demand can be attained. Therefore, it compares, when requiring distribution registration, whenever it changes a \*\* area cel, and useless signal processing in migration communication system can be omitted. Therefore, the system by which the increase in efficiency of signal processing was attained can be offered.

[0117] In addition, in migration communication system, when a mobile station moves with modification of a \*\* area cel, the so-called handover processing is performed. A base station can know that the mobile station has newly moved to the cel which a local station forms by performing this handover processing.

[0118] According to this invention, a multicast packet is distributed further again only to the trunk connection equipment which has jurisdiction [ area / where the mobile station which wishes to distribute exists ]. therefore, a gateway unit — distribution — a multicast packet is not transmitted even to unnecessary trunk connection equipment. Therefore, the transmission efficiency of a packet can be improved. Therefore, improvement in system efficiency can be aimed at.

[0119] Furthermore, according to this invention, since wireless resource information is assigned in common to two or more mobile stations, a wireless resource can be used effectively for one mobile station compared with the case where the wireless resource information on a proper is assigned. Therefore, the migration communication system whose system efficiency improved can be offered.

[0120] According to this invention, when a mobile station changes the jurisdiction area of a base station controller, a circuit is secured by subscriber line extension control further again. Therefore, even if it is the case where jurisdiction area is changed while a mobile station communicates, a line connection condition does not break off. Therefore, when the mobile station has received the multicast packet, even if it changes jurisdiction area, generating of a packet loss can be prevented. Therefore, improvement in communication link quality can be aimed at.

[0121] Furthermore, according to this invention, a base station controller can check the necessity of distribution of the multicast packet of a mobile station. Transmitted power control can be performed to coincidence. Therefore, a mobile station can receive an electric wave with sufficient power. Therefore, a quality communication link is realizable. Therefore, improvement in effectiveness of mobile data communication system can be aimed at.

[Translation done.]

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the migration communication system and the mobile station which have the multicast packet transmission function to transmit one multicast packet sent out to a detail from IP (Internet Protocol) packet communication system to two or more mobile stations more about migration communication system and mobile stations, such as cellular system.

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**PRIOR ART**

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[Description of the Prior Art] Conventionally, the wireless circuit of migration communication system is used and the mobile data communication system which transmits a packet from the computer contained in a point-to-point-communication system to the mobile station in migration communication system is known. There are some which realize packet transmission by the so-called tunneling in migration communication system in this mobile data communication system.

[0003] If it explains in full detail more, this migration communication system is performing packet transmission by the above-mentioned tunneling in between the gateway unit which functions as the gate between point-to-point-communication systems, and the support equipment which has jurisdiction [ area / location registration ] in migration communication system. This tunneling transmits a packet on the logical transfer pass (tunnel) established based on the positional information of a mobile station. Thereby, packet transmission to the mobile station which moves is made possible.

[0004] On the other hand, in IP (Internet Protocol) packet communication system represented by internet/intranet, the so-called multicast communication link is performed from the former. A multicast communication link transmits a multicast packet from one computer to two or more computers. There is meeting junction etc. as a use gestalt of a multicast communication link.

[0005] The multicast communication link in IP packet communication system is performed according to the control procedure called IGMP (Internet Group Management Protocol). In IGMP, the transmission place of a multicast packet is managed by the router in IP packet communication system. That is, only the number equivalent to the number of transmission places reproduces a multicast packet, and a router transmits the multicast packet obtained as a result to each transmission place, when two or more transmission places exist.

[0006] By the way, if this multicast communication link can be used in mobile data communication system, for a user, it is very convenient. That is, even if it is a going-out place, it is because he can watch meeting junction etc. Then, a technique of using the multicast communication link in IP packet communication system also in mobile data communication system is desired.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] When applying the multicast packet communication link in connectionless mode packet communication system to migration communication system as mentioned above according to this invention, a multicast packet is reproduced in trunk connection equipment. Therefore, what is necessary is just to transmit one multicast packet, even if two or more distribution place mobile stations exist in connectionless mode packet communication system. And what is necessary is just to transmit one multicast packet between a gateway unit and trunk connection equipment. Therefore, compared with the case where a multicast packet is reproduced and transmitted within connectionless mode packet communication system, a multicast packet can be transmitted efficiently. Therefore, system efficiency can be improved.

[0114] Moreover, according to this invention, when moving with modification of \*\* area area, such as a cel and location registration area, the mobile station is made to perform the distribution demand of a multicast packet with a location registration demand or a handover demand through a control channel. Therefore, compared with the case where a packet distribution demand is performed through a communication channel, a multicast packet can be quickly transmitted to a mobile station. In other words, a mobile station can receive a multicast packet quickly.

[0115] Since a communication channel cannot be used because of packet transmission, it is necessary to make packet transmission stand by, in performing a packet distribution demand through a communication channel, if it explains in full detail more. However, packet transmission can be performed by performing a packet distribution demand not through a communication channel but through a control channel, without waiting for a packet distribution demand. Therefore, a packet can be transmitted efficiently and a packet can be efficiently received in a mobile station.

[0116] Furthermore, according to this invention, from the base station which forms the cel immediately after modification, when a mobile station moves with modification of a \*\* area cel, whenever the desired multicast packet is not distributed, distribution registration is required from the base station concerned. That is, when the multicast packet of the group in whom a local station exists from the base station which forms the cel immediately after modification is distributed, the multicast packet can be received. Therefore, even if a mobile station does not carry out distribution registration at every migration, it can receive a multicast packet. That is, in a mobile station, the increase in efficiency of a distribution registration demand can be attained. Therefore, it compares, when requiring distribution registration, whenever it changes a \*\* area cel, and useless signal processing in migration communication system can be omitted. Therefore, the system by which the increase in efficiency of signal processing was attained can be offered.

[0117] In addition, in migration communication system, when a mobile station moves with modification of a \*\* area cel, the so-called handover processing is performed. A base station can know that the mobile station has newly moved to the cel which a local station forms by performing this handover processing.

[0118] According to this invention, a multicast packet is distributed further again only to the trunk connection equipment which has jurisdiction [ area / where the mobile station which

wishes to distribute exists ]. therefore, a gateway unit — distribution — a multicast packet is not transmitted even to unnecessary trunk connection equipment Therefore, the transmission efficiency of a packet can be improved. Therefore, improvement in system efficiency can be aimed at.

[0119] Furthermore, according to this invention, since wireless resource information is assigned in common to two or more mobile stations, a wireless resource can be used effectively for one mobile station compared with the case where the wireless resource information on a proper is assigned. Therefore, the migration communication system whose system efficiency improved can be offered.

[0120] According to this invention, when a mobile station changes the jurisdiction area of a base station controller, a circuit is secured by subscriber line extension control further again. Therefore, even if it is the case where jurisdiction area is changed while a mobile station communicates, a line connection condition does not break off. Therefore, when the mobile station has received the multicast packet, even if it changes jurisdiction area, generating of a packet loss can be prevented. Therefore, improvement in communication link quality can be aimed at.

[0121] Furthermore, according to this invention, a base station controller can check the necessity of distribution of the multicast packet of a mobile station. Transmitted power control can be performed to coincidence. Therefore, a mobile station can receive an electric wave with sufficient power. Therefore, a quality communication link is realizable. Therefore, improvement in effectiveness of mobile data communication system can be aimed at.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, in having applied the multicast communication link in IP packet communication system to the above mobile data communication system as it was, there is fear which is not enough.

[0008] Then, the purpose of this invention is offering the migration communication system and the mobile station which can aim at improvement in system efficiency, when applying the multicast communication link in connectionless formal \*\* systems, such as IP packet communication system, to mobile communication.

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**MEANS**

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[Means for Solving the Problem] Two or more base stations where this invention for attaining the above-mentioned purpose communicates with two or more mobile stations and two or more of these mobile stations, The base station controller which has jurisdiction [ base stations / these / two or more ], and the trunk connection equipment which sets up an access link among two or more above-mentioned mobile stations, respectively, It is prepared between this trunk connection equipment and connectionless mode packet communication system. It has the gateway unit which communicates by tunneling between the above-mentioned trunk connection equipment. It is the migration communication system which has the function to transmit the multicast packet transmitted from the terminal with which the above-mentioned connectionless mode packet communication system is equipped to two or more mobile stations through the above-mentioned access link. The above-mentioned trunk connection equipment by reproducing the above-mentioned multicast packet A means to create a number equivalent to the number of the mobile stations (henceforth a "distribution place mobile station") by which distribution registration was carried out of multicast packets, It is the migration communication system characterized by being a thing including a means to distribute this created multicast packet through the above-mentioned access link to the above-mentioned distribution place mobile station.

[0010] Moreover, this invention is migration communication system characterized by being a thing including a means to require distribution registration of a multicast packet of the above-mentioned trunk connection equipment through a control channel with location registration or a handover, when the above-mentioned mobile station moves with modification of \*\* area area.

[0011] Furthermore, this invention receives the mobile station which the above-mentioned base station has moved to the cel which a local station forms. It is a thing including a means to report the information about the multicast packet which the local station has distributed through an information channel. A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet to which the above-mentioned mobile station is reported from the above-mentioned base station, When the desired multicast packet was not distributed and it is distinguished, it is the migration communication system characterized by being a thing including a means to require distribution registration of the multicast packet of the request concerned of the above-mentioned trunk connection equipment through the above-mentioned access link.

[0012] A means to distinguish whether this invention has distributed the multicast packet corresponding to the demand concerned when two or more above-mentioned trunk connection equipments are formed for every predetermined area and distribution registration is required from the above-mentioned mobile station further again, When the multicast packet corresponding to the above-mentioned demand was not distributed and it is distinguished It is what includes further a means to require distribution registration of a multicast packet from the above-mentioned gateway unit. When a distribution registration demand has the above-mentioned gateway unit from the above-mentioned trunk connection equipment, it is the migration communication system characterized by being a thing including a means to distribute the multicast packet corresponding to the demand concerned to the trunk connection equipment



which has carried out the demand concerned.

[0013] Furthermore, this invention is that to which the migration communication system concerned makes CDMA (Code Division Multiple Access) a telecommunications access method. A means by which the above-mentioned base station controller assigns common wireless resource information to two or more mobile stations, It is a thing including a means to notify that a multicast packet is distributed based on this assigned wireless resource information to each base station of the above-mentioned controlled system. When the above-mentioned base station receives the above-mentioned notice from the above-mentioned base station controller, it is the migration communication system characterized by being a thing including a means to distribute a multicast packet to a mobile station based on the above-mentioned wireless resource information.

[0014] When the above-mentioned mobile station changes the jurisdiction area of the above-mentioned base station controller, the above-mentioned trunk connection equipment this invention further again It is what includes further a means to notify that a circuit is secured by subscriber line extension control to each above-mentioned base station controller in the base station controller immediately after modification from the base station controller in front of modification. Each above-mentioned base station controller is the migration communication system characterized by being a thing including a means to secure a circuit by answering the notice of the above-mentioned trunk connection equipment, and performing subscriber line extension control.

[0015] Furthermore, a means by which this invention transmits the question signal with which the above-mentioned base station controller checks the existence of the need for distribution of the above-mentioned multicast packet to a base station, It is a thing including a means to transmit the power measurement indication signal which directs received-power measurement to the above-mentioned base station. The above-mentioned base station A means to transmit the above-mentioned question signal to the above-mentioned mobile station, and a means to measure the received power of the reply signal transmitted from a mobile station when the above-mentioned power measurement indication signal is received, It is a thing including a means to transmit this measured received-power value to the above-mentioned base station controller. A means by which the above-mentioned base station controller holds the received-power value transmitted from the above-mentioned base station including a means by which the above-mentioned mobile station transmits the reply signal over reception of the above-mentioned question signal to the above-mentioned base station, In case a multicast packet is distributed to a mobile station, it is the migration communication system characterized by being what includes further a means to control the transmitted power of a base station, based on the received-power value by which maintenance is carried out [ above-mentioned ].

[0016] This invention is the mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link further again, and when moving with modification of \*\* area area, it is the mobile station characterized by to include a means require distribution registration of a multicast packet through a control channel with location registration or a handover.

[0017] Furthermore, this invention is a mobile station which receives the multicast packet from the ground equipment created when only the number of the mobile stations registered based on the distribution registration demand reproduced the multicast packet transmitted by tunneling through an access link. A means to distinguish whether the desired multicast packet is distributed based on the information about the multicast packet which received, When the desired multicast packet was not distributed and it is distinguished, it is the mobile station characterized by including a means to require distribution registration of the multicast packet of the request concerned.

[0018]

[Embodiment of the Invention] Below, the gestalt of implementation of this invention is explained to a detail with reference to an accompanying drawing.

[0019] In addition, the following operation gestalten 1 thru/or 7 may be the structure of a

system different, respectively, and may correspond to each function in one system, respectively.

[0020] Gestalt 1. drawing 1 of operation is the block diagram showing the configuration of the mobile data communication system with which the migration communication system concerning the operation gestalt 1 of this invention is applied. This mobile data communication system is equipped with IP (Internet Protocol) packet communication system 1 and the migration communication system 10. This mobile data communication system transmits to coincidence the multi-packet sent out from the IP terminal 2 in IP packet communication system 1 to two or more mobile stations 11 in the migration communication system 10.

[0021] IP — packet communication — a system — one — a connectionless mode — a packet — communication system — it is — plurality — IP — a terminal — two — plurality — a router — three — and — a gateway unit — (— GW —) — four — having — \*\*\*\*. The IP terminal 2 consists of a personal computer, a workstation, a server, etc., and mounts IP. A gateway unit 4 functions between IP packet communication system 1 and the migration communication system 10 as the gate by the side of IP packet communication system 1.

[0022] The IP terminal 2 divides and sends out transmit data to two or more packets. Each packet consists of a header unit and data division. A header unit includes the IP address which specifies a mobile station 11, when transmitting transmit data to a mobile station 11. For example, a header unit contains the multicast address which specifies one distribution group containing the unicast address which specifies one mobile station 11, or two or more mobile stations 11. In addition, below, the packet which contains a unicast packet, a call, and a multicast address in a header unit for the packet which contains a unicast address in a header unit is called a multicast packet.

[0023] A router 3 relays the packet sent out from the IP terminal 2. The multicast packet sent out from the router 3 is given to a gateway unit 4. After giving a gateway unit 4 from the IP address of the destination to the packet which was able to give processing of specifying \*\*\*\*\*, it is sent out to the migration communication system 10.

[0024] The migration communication system 10 is equipped with a mobile station 11 and ground equipment 12. CDMA (Code Division Multiple Access) is used for the migration communication system 10 as a telecommunications access method between a mobile station 11 and ground equipment 12. That is, in a mobile station 11 and the base station 13 in ground equipment 12, the primary modulation by predetermined primary modulation techniques, such as QPSK (Quadrature Phase Shift-Keying), is performed to transmit data, and a primary modulating signal is created. Then, the secondary modulation using the diffusion code of each user proper is performed to this created primary modulating signal, and a secondary modulating signal is created. And the electric wave based on this created secondary modulating signal is emitted. Thus, the communication link between a mobile station 11 and ground equipment 12 is attained.

[0025] The mobile station 11 has portable computer terminal 11a and migration machine 11b of a note type personal computer etc. Migration machine 11b consists of telephones in which data communication is possible. Specifically, migration machine 11b consists of a portable telephone, PHS (Personal Handyphone System) telephone, etc. Migration machine 11b is connected to computer terminal 11a at the time of use. In addition, a mobile station 11 is a simple substance and may consist of things in which data communication is possible.

[0026] the ground — equipment — 12 — plurality — a base station — 13 — plurality — a base station controller — 14 — plurality — a support — equipment — 15 — a gateway unit — (— GW —) — 16 — and — a home position — a register — 17 — having — \*\*\*\*. A base station 13 forms the cel which consists of a sector of plurality (three [ for example, ]), and communicates with the mobile station 11 which exists in this cel. A base station controller 14 is connected to two or more base stations 13, and it has jurisdiction [ area / which consists of each cel formed of each connected base station 13 concerned / jurisdiction ].

[0027] Support equipment 15 is formed for every location registration area which is the smallest unit which grasps the location of a mobile station 11. Location registration area consists of two or more cels. Support equipment 15 is connected to the home-position register 17, a gateway unit 16, and all the base station controllers 14 formed in location registration area. Support

equipment 15 has the function to set up an access link between mobile stations 11. An access link is a logical channel at the time of the packet transmission between support equipment 15 and a mobile station 11, and a multi-statement is carried out for every QOS (Quality Of Service) class every mobile station 11 again. This access link has functions, such as error control (for example, ARQ; error recovery by automatic resending), according to QOS.

[0028] Support equipment 15 has distribution registration table 15a. Distribution registration table 15a shows the correspondence relation between the access link 11, i.e., a mobile station, and the logical channel for transmitting the multicast packet as which the mobile station 11 concerned is demanding distribution. Support equipment 15 specifies the distribution place mobile station which should distribute a multicast packet by referring to this distribution registration table 15a. Moreover, support equipment 15 updates the contents of distribution registration table 15a by receiving a demand/discharge of distribution registration from a mobile station 11.

[0029] Registration to distribution registration table 15a is performed by transmitting a distribution registration demand signal to ground equipment 12 from a mobile station 11.

Specifically, a mobile station 11 transmits a distribution registration demand signal to a base station 13. A base station 13 transmits a distribution registration demand signal to a base station controller 14. A base station controller 14 transmits the received distribution registration demand signal to support equipment 15. Support equipment 15 matches the mobile station 11 (access link) which has required distribution registration, and the multicast packet which should be distributed, and registers it into distribution registration table 15a.

[0030] The home POSITION register 17 memorizes the subscriber data of a mobile station 11. A subscriber data contains the current position and the distribution group table of the subscriber's number of a proper, and a mobile station. A distribution group table shows the correspondence relation between a mobile station 11 and a distribution group.

[0031] The gateway unit 16 is connected to the gateway unit 4 of IP packet communication system 1. Moreover, the gateway unit 16 is connected also to the home-position register 17. A gateway unit 16 functions as the gate by the side of the migration communication system 10 between IP packet communication systems 1. Specifically, a gateway unit 16 carries out routing of the transmission place of the packet sent out from IP packet communication system 1 based on the subscriber data memorized by the home-position register 17.

[0032] A gateway unit 16 and support equipment 15 perform data transmission by the so-called tunneling. When transmitting a multicast packet from a gateway unit 16 to support equipment 15, a gateway unit 16 more specifically forms logical transfer pass (tunnel) between support equipment 15. And a multicast packet is transmitted on this formed transfer pass. Thus, with this operation gestalt 1, a gateway unit 16 and support equipment 15 serve as the starting point of a tunnel, and a terminal point, respectively.

[0033] Drawing 2 is a flow chart which shows processing of support equipment 15. In order to distribute a multicast packet to a mobile station 11, it is necessary to set up an access link between a mobile station 11 and support equipment 15. Then, a mobile station 11 requires a setup of an access link from the support equipment 15 of ground equipment 12 after powering on. Answering this, support equipment 15 sets up an access link between mobile stations 11 (step S1).

[0034] If a multicast packet is sent out from the IP terminal 2 in IP packet communication system 1, the multicast packet concerned will be sent out to the migration communication system 10 through a router 3 and a gateway unit 4.

[0035] The multicast packet sent out from IP packet communication system 1 is received in a gateway unit 16. A gateway unit 16 determines the support equipment 15 which should distribute a multicast packet based on the subscriber data memorized by the multicast address and the home-position register 17 of a multicast packet which were received. Specifically, a gateway unit 16 specifies whether which mobile station 11 is contained in the distribution group corresponding to the multicast address concerned by referring to a distribution group table.

[0036] Furthermore, a gateway unit 16 recognizes the location registration area where the mobile station 11 contained in a distribution group exists based on the current position data contained

in a subscriber data. Then, a gateway unit 16 determines the support equipment 15 corresponding to this recognized location registration area as the destination.

[0037] A gateway unit 16 transmits a multicast packet by tunneling to the support equipment 15 determined as the destination. In this case, when two or more support equipments 15 are determined as the destination, only the number of support equipment 15 reproduces a multicast packet, and a gateway unit 16 transmits this duplicate multicast packet to each support equipment 15 by tunneling.

[0038] Support equipment 15 will distinguish whether the received packet is a multicast packet, if a packet is received from a gateway unit 16 (step S2) (step S3). If it is a multicast packet, support equipment 15 specifies the mobile station 11 contained in the group who should distribute the multicast packet concerned (step S4). Specifically, support equipment 15 specifies the mobile station 11 contained in a distribution group and its distribution group based on the distribution group table memorized by the multicast address contained in the transmitted multicast packet, and the home-position register 17.

[0039] Then, support equipment 15 specifies the mobile station (henceforth a "distribution place mobile station") 11 registered into distribution registration table 15a noting that it wishes to distribute with reference to distribution registration table 15a among the mobile stations 11 by which specification was carried out [ above-mentioned ] (step S5). And support equipment 15 reproduces the received multicast packet, in order to create a number equivalent to the number of the distribution place mobile stations 11 of multicast packets (step S6). That is, reproduction of a multicast packet is performed in the support equipment 15 with which it is the terminal point of the transfer pass for tunneling, and an access link is set up between mobile stations 11.

[0040] Then, each of this reproduced multicast packet is transmitted on an access link to the distribution place mobile station 11 (step S7). Support equipment 15 specifies the base station controller 14 which has jurisdiction [ area / where the distribution place mobile station 11 exists / jurisdiction ], and, specifically, transmits the multicast packet after a duplicate per frame on an access link to the specified base station controller 14 concerned.

[0041] A base station controller 14 is transmitted on an access link to the base station 13 which forms the cel in which the distribution place mobile station 11 exists the transmitted multicast packet. A base station 13 emits the electric wave based on the transmitted multicast packet to a cel. Thereby, a mobile station 11 can receive a multicast packet.

[0042] In addition, in distinction processing of step S3, since it is thought that it is a unicast packet when it is not a multicast packet, support equipment 15 transmits a unicast packet through an access link to the mobile station 11 used as the destination (step S8).

[0043] He is trying to reproduce a multicast packet in the support equipment 15 with which it is the terminal point of the transfer pass at the time of performing the communication link by tunneling between gateway units 16, and the access link of a proper is set up between mobile stations 11 as mentioned above according to this operation gestalt 1.

[0044] Therefore, of course, the inside of IP packet communication system 1 of the multicast packet transmitted is one also in the transmission section between a gateway unit 16 and support equipment 15. Therefore, compared with the case where a multicast packet is reproduced in IP packet communication system 1, a multicast packet can be transmitted efficiently. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0045] Gestalt 2. drawing 3 of operation is a flow chart for explaining distribution registration demand processing of the mobile station 11 in the mobile data communication system with which the migration communication system concerning the operation gestalt 2 of this invention is applied. In the following explanation, drawing 1 is referred to to coincidence.

[0046] This operation gestalt 2 explains the distribution registration demand processing in the case of moving to another location registration area, while a mobile station 11 receives a multicast packet. A mobile station 11 needs to require distribution registration anew from the support equipment 15 which has jurisdiction [ area / of a migration place / location registration ], when carrying out migration which continued location registration area. In this case, a mobile station 11 can consider requiring distribution registration of ground equipment 12

through a communication channel.

[0047] However, there is a possibility of taking time amount until it must start distribution of a multicast packet and distribution of a multicast packet is performed, after ground equipment 12 waits for completion of distribution registration in this case. Then, when a mobile station 11 moves between cels, he combines with this handover demand and is trying for this operation gestalt 2 to require distribution registration in consideration of performing a handover demand using a control channel.

[0048] If it explains in full detail more, a base station controller 14 will always direct offer of information information to all the base stations 13 it has jurisdiction [ base stations ].

Information information includes empty channel information. A base station 13 turns an electric wave including the received information information to a cel, and is emitting it through an information channel. In this way, it is vacant to the mobile station 11 which moves to a self-cel, and the channel is always told.

[0049] On the other hand, the mobile station 11 is monitoring continuously whether a \*\* area cel is changed, when the multicast packet is received. Specifically, a mobile station 11 detects the quality (for example, receiving level) of a received electric wave (step T1). Moreover, it distinguishes whether the mobile station 11 fell under to the threshold predetermined in this detected quality (step T2). The threshold is set as the value equivalent to minimum receiving quality required for a communication link. If quality falls under to the above-mentioned threshold, since it will be thought that the boundary of a cel has been approached, a mobile station 11 performs carrier sense (step T3). Carrier sense is processing which detects the frequency currently used in the contiguity cel, in order to acquire a good receive state.

[0050] Detection of a frequency distinguishes whether the channel corresponding to this detected frequency is vacant as for the mobile station 11 (step T four). Specifically, a mobile station 11 compares the channel corresponding to the detected frequency with the received empty channel of information information. By the channel corresponding to the detected frequency being vacant, if it is not a channel (NO of step T four), a mobile station 11 will perform carrier sense in step T3 again that another channel should be specified. By on the other hand the channel corresponding to the detected frequency being vacant, if it is a channel (YES of step T four), a handover demand signal will be transmitted through a control channel to the base station 13 of a migration place so that a mobile station 11 may change a communication channel to this empty channel (step T5). As a control channel, CCCH (Common Control Channel) etc. is applicable.

[0051] A handover demand signal contains distribution associated data, as shown in drawing 4 . Distribution associated data contains classification data and address data. Classification data specify a demand/cancellation of distribution. Address data specify the IP address (multicast address) which wishes a demand/cancellation of distribution. In addition, a handover demand signal contains message classification data, random access number data, jurisdiction area data, and location registration area data. Message classification data specify a handover demand.

[0052] A base station 13 is transmitted to the base station controller 14 to which the received handover demand signal is connected in the local station. A base station controller 14 will be transmitted to the support equipment 15 to which this handover demand signal is connected in self-equipment, if a handover demand signal is received. Consequently, support equipment 15 receives a handover demand signal.

[0053] Support equipment 15 will recognize the data contained in the handover demand signal concerned, if a handover demand signal is received. If distribution associated data is not contained, support equipment 15 directs a handover to the base station controller 14 which has transmitted the handover demand signal.

[0054] A base station controller 14 directs channel release to the base station 13 of a moved material while directing channel setup to the base station 13 of a migration place according to directions of this handover. In this way, a handover is attained.

[0055] On the other hand, if distribution associated data is contained, support equipment 15 specifies the mobile station 11 which has transmitted the handover demand signal concerned based on any the access links where it has been transmitted to the handover demand signal are.

Then, support equipment 15 accesses distribution registration table 15a, and registers the access link corresponding to the mobile station 11 concerned. In this way, distribution registration is attained.

[0056] Thus, according to this operation gestalt 2, the mobile station 11 is demanding distribution registration of a demand and coincidence of a handover through a control channel. Therefore, the increase in efficiency of packet transmission can be attained compared with the case where a distribution registration demand is performed through a communication channel. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0057] Gestalt 3. drawing 5 of operation is a flow chart for explaining distribution registration demand processing of the base station controller 14 in the mobile data communication system with which the migration communication system concerning the operation gestalt 3 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0058] With the gestalt 2 of the above-mentioned implementation, while receiving a multicast packet, the case where it moves to another location registration area is assumed. On the other hand, with this operation gestalt 3, the case where it moves to another location registration area in the condition of having not received the multicast packet is assumed.

[0059] In such a case, a mobile station 11 needs to require location registration not in a handover but in new location registration area. This location registration demand is usually performed using control channels, such as SCCH. Then, in such a case, in a mobile station 11, it combines with a location registration demand and is made to perform a distribution registration demand.

[0060] Specifically, a mobile station 11 is transmitted to the base station 13 which has jurisdiction [ cel / of a migration place ] for a location registration demand signal. A location registration demand signal contains message classification, user ID, location registration area data, and distribution associated data, as shown in drawing 6 . Message classification specifies requiring location registration. Distribution associated data contains classification data and address data as well as the distribution associated data in the handover demand signal shown in drawing 4 .

[0061] A base station 13 is transmitted to the base station controller 14 to which the received location registration demand signal is connected in the local station. Consequently, a base station controller 14 receives a location registration demand signal (step U1). A base station controller 14 transmits the received location registration demand signal to support equipment 15 (step U2).

[0062] According to a location registration demand, support equipment 15 accesses the home-position register 17, and changes the current position of the mobile station 11 concerned into a new location. Thereby, location registration is attained. Moreover, support equipment 15 accesses distribution registration table 15a, and registers the access link set up between the mobile stations 11 concerned. In this way, distribution registration is attained.

[0063] If location registration and distribution registration are performed, support equipment 15 will transmit the reply signal which shows that location registration and distribution registration were performed to a base station controller 14. A base station controller 14 includes wireless resource information required for distribution of a multicast packet in a reply signal, when a reply signal is received (step U3). Then, a base station controller 14 transmits a reply signal including wireless resource information to a base station 13 (step U4).

[0064] Wireless resource information contains the radio frequency, diffusion code, and sector number which are used for distribution of a multicast packet. In this case, wireless resource information is not assigned according to an individual to a mobile station 11, but is assigned in common to two or more mobile stations 11 which are performing distribution registration about the same multicast packet. the case where other mobile stations 11 which are performing distribution registration of the same multicast packet already exist in the location registration area of a migration place — being concerned — others — the wireless resource information currently used for radio with a mobile station 11 is assigned.

[0065] A base station 13 will perform the transmission control of the wireless section based on

the wireless resource information included in this received reply signal, if a reply signal is received. After a base station 13 creates a primary modulating signal based on the frequency contained in wireless resource information and creates a secondary modulating signal based on the diffusion code further contained in wireless resource information, specifically, it emits the electric wave based on a secondary modulating signal to the sector corresponding to the sector number contained in wireless resource information.

[0066] According to this operation gestalt 3, it is made to perform a distribution registration demand through a control channel as mentioned above. Therefore, compared with the case where a distribution registration demand is performed through a communication channel, the mobile data communication system whose system efficiency improved can be offered.

[0067] Moreover, when performing distribution registration of a multicast packet, other mobile stations 11 and common wireless resource information are assigned. Therefore, a deployment of a wireless resource can be aimed at. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0068] Gestalt 4. drawing 7 of operation is a flow chart for explaining distribution registration demand processing of the mobile station 11 in the mobile data communication system with which the migration communication system concerning the operation gestalt 4 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0069] This operation gestalt 4 explains the distribution registration demand processing in the case of moving between cels, while a mobile station 11 receives a multicast packet. When a mobile station 11 moves between cels, it is unknown whether the multicast packet of the same class as the multicast packet under reception is distributed to the cel of a migration place. Therefore, when moving between cels, it is possible to always require distribution registration from ground equipment 12 from a mobile station 11.

[0070] However, when the mobile station 11 contained in the same distribution group already exists in the cel of a migration place with a local station, the multicast packet under reception and the multicast packet of the same class may already be distributed to the cel of a migration place. Then, he is trying for this operation gestalt 4 to require distribution registration from ground equipment 12 in consideration of such time only within the case where the multicast packet under reception in the cel of a migration place is not distributed, from a mobile station 11.

[0071] If it explains in full detail more, the base station 13 will have transmitted the information information signal through an information channel toward a cel, when distributing a multicast packet. This is telling whether it is that the multicast packet which wishes to distribute is distributed to the cel concerned to the mobile station 11 which has moved to the cel concerned.

[0072] As an information channel, BCCH (Broadcast Control Channel) etc. is applicable. In this case, BCCH which can be set is for not reporting information about a system at large [, such as Network ID, Cel ID, and a logical channel configuration, ], and reporting the information about distribution of a multicast packet.

[0073] An information information signal contains packet related information, as shown in drawing 8 (a). Packet related information contains each data of message classification, information-element length, location registration area, a frequency band, diffusion information, and address information, as shown in drawing 8 (b).

[0074] Message classification data specify the classification of the message transmitted to a mobile station 11. Specifically, what kind of information element or an information-element group specifies whether it is contained in the message transmitted to a mobile station 11. Information-element length specifies the message length transmitted to a mobile station 11. Each data of a frequency band and diffusion information specifies the frequency band and diffusion information about a channel on the direction from which it gets down (base station 13 → mobile station 11). [ for distributing the multicast packet shared between two or more mobile stations 11 ] Address information specifies the information about the multicast packet which is performing current distribution. The information concerned contains the packet ID for identifying address information and the mobile station group (distribution group) which receives a multicast packet.



[0075] In addition, an information information signal contains the BCCH identification information, the transmitted power information, the amount of uphill interference, and CRC (Cyclic Redundancy Check) other than packet related information, as shown in drawing 8 (a).

[0076] It returns to drawing 7, and a mobile station 11 receives the information information signal transmitted through the information channel from the base station 13 which forms the cel of a migration place, when moving between cels while receiving a multicast packet (step V1). Then, a mobile station 11 checks the packet related information contained in the received information information signal (step V2), and the same multicast packet as the multicast packet which a local station is receiving distinguishes whether it distributes from the base station 13 of a migration place (step V3).

[0077] If it does not distribute (NO of step V3), a mobile station 11 transmits a distribution registration demand signal to a base station 13 (step V4). Distribution registration is attained by transmitting a distribution registration demand signal to support equipment 15 through a base station controller 14 from a base station 13, and updating distribution registration table 15a in support equipment 15 like the case of the above-mentioned operation gestalt 2, after that.

[0078] On the other hand, if it distributes (YES of step V3), a mobile station 11 will not transmit a distribution registration demand signal. However, even if it is this case, the registration situation of distribution registration table 15a before migration shows that the mobile station 11 concerned wishes distribution registration. Therefore, a mobile station 11 can receive succeedingly the multicast packet under reception, and the multicast packet of the same class. [0079] Thus, the mobile station 11 is made to give the demand of distribution registration according to this operation gestalt 4 to ground equipment 12 only within the case where the multicast packet of the same class as the multicast packet which the local station has received is not distributed from the base station 13 of a migration place, in case it moves between cels. Therefore, also when having already distributed, compared with the case where a distribution registration demand is performed, signal processing in ground equipment 12 becomes easy.

Therefore, the effectiveness of signal processing can be improved.

[0080] In addition, when requiring distribution registration, you may make it require distribution registration through a control channel like the above-mentioned operation gestalt 2 with a handover demand. In this case, improvement in packet transmission efficiency can be aimed at like the above-mentioned operation gestalt 2.

[0081] Gestalt 5. drawing 9 of operation is a flow chart for explaining the processing at the time of distribution registration of the support equipment 15 in the mobile data communication system with which the migration communication system concerning the operation gestalt 5 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0082] This operation gestalt 5 explains processing of support equipment 15 in case distribution registration has been required from ground equipment 12 from the mobile station 11. A mobile station 11 may move to another location registration area. In this case, since different support equipment 15 and a different communication link will be performed, a mobile station 11 needs to require distribution registration of a multicast packet anew.

[0083] When the mobile station which wishes distribution of the multicast packet of the same class as a local station exists in the location registration area of a migration place, a mobile station 11 only performs the above-mentioned distribution registration demand, and can receive a desired multicast packet. That is, it is because the desired multicast packet is already distributed in the cel of a migration place.

[0084] When the mobile station 11 which, on the other hand, wishes distribution of the multicast packet of the same class as a local station does not exist in the location registration area of a migration place, the gateway unit 16 has not transmitted the multicast packet to the support equipment 15 which has jurisdiction [ area / concerned / location registration ]. Therefore, the multicast packet will be distributed to any cel in the location registration area concerned. Therefore, even if support equipment 15 receives distribution registration from a mobile station 11, it cannot distribute the multicast packet according to a distribution demand to a mobile station 11.



[0085] Then, the distribution situation of a multicast packet is investigated in support equipment 15, and it enables it to distribute a multicast packet to a mobile station 11 in consideration of such a case with this operation gestalt 5.

[0086] When explaining in full detail more and the distribution registration demand signal from a mobile station 11 is received (step W1), support equipment 15 distinguishes whether the multicast packet according to a demand is distributed. Specifically, support equipment 15 checks the multicast packet which the mobile station 11 is demanding based on the address data contained in distribution associated data (step W2). Subsequently, the mobile station 11 with which support equipment 15 has required distribution registration distinguishes whether it registers with distribution registration table 15a (step W3).

[0087] If registered (YES of step W3), the mobile station 11 will not have moved from another location registration area, and it will be thought that distribution registration is newly required in the same location registration area. Therefore, support equipment 15 registers the mobile station 11 concerned into distribution registration table 15a in this case as usual. Consequently, a mobile station 11 can receive the multicast packet distributed from support equipment 15. On the other hand, if not registered (NO of step W3), support equipment 15 registers into distribution registration table 15a the mobile station 11 which has required distribution registration (step W4).

[0088] Next, it distinguishes whether support equipment 15 has distributed the multicast packet corresponding to the distribution registration demand concerned (step W5). If the multicast packet is distributed (YES of step W5), support equipment 15 will be transmitted to a base station controller 14 that the multicast packet distributed should be distributed to the mobile station 11 which has required distribution registration. On the other hand, if the multicast packet is not distributed (NO of step W5), support equipment 15 is required from a gateway unit 16 so that the multicast packet concerned may be distributed (step W6).

[0089] If a distribution demand is carried out from support equipment 15, a gateway unit 16 will reproduce the multicast packet according to a demand, and will transmit the reproduced multicast packet to the support equipment 15 which has carried out the distribution demand. Thereby, support equipment 15 can distribute the multicast packet according to a demand to the mobile station 11 which has required distribution registration.

[0090] Thus, according to this operation gestalt 5, when there is a distribution registration demand of a multicast packet from a mobile station 11, support equipment 15 requires distribution of a multicast packet from a gateway unit 16, whenever it has not received distribution of a multicast packet from a gateway unit 16.

[0091] Therefore, compared with the case where a multicast packet is beforehand distributed from a gateway unit 16 to all the support equipments 15, processing in a gateway unit 16 and support equipment 15 can be simplified supposing this case. Therefore, it can consider as the mobile data communication system whose processing effectiveness improved.

[0092] Gestalt 6. drawing 10 of operation is a flow chart for explaining the processing at the time of distribution registration of the support equipment 15 in the mobile data communication system with which the migration communication system concerning the operation gestalt 6 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0093] With this operation gestalt 6, when a mobile station 11 moves between cels while receiving a multicast packet and distribution registration has been required from the mobile station 11, the subscriber line extension control performed in support equipment 15 and a base station controller 14 is explained. When a mobile station 11 moves between cels while receiving a multicast packet, it is possible to only perform a setup and release of a circuit by the handover. However, although it is an instant, since a circuit is severed in this case, there is a possibility that a packet loss may occur. So, with this operation gestalt 6, the subscriber line extension control to which the hits of the circuit are not carried out has realized the channel change.

[0094] If it explains in full detail more, a mobile station 11 will transmit a distribution registration demand signal to a base station 13, when moving between cels. A base station 13 transmits the received distribution registration demand signal to a base station controller 14. A base station

controller 14 transmits the received distribution registration demand signal to support equipment 15. Consequently, support equipment 15 receives a distribution registration demand signal (step X1).

[0095] Support equipment 15 distinguishes whether the base station controller 14 which has transmitted the distribution registration demand signal differs from the base station controller 14 which had distributed the multicast packet before migration to the mobile station 11 concerned (step X2). If it differs (NO of step X2), it will distinguish whether support equipment 15 is the distribution demand of the multicast packet of the same class as the multicast packet distributed from the base station 13 of a moved material to the mobile station 11 concerned (step X3). When it is the multicast packet of the same class, support equipment 15 performs subscriber line extension control for circuit reservation (step X4).

[0096] Specifically, it is required that support equipment 15 should connect a circuit between the base station controllers 14 of a moved material to the base station controller 14 of a migration place. Moreover, it is required that support equipment 15 should connect a circuit between the base station controllers 14 of a migration place also to the base station controller 14 of a moved material. Two base station controllers 14 of which the line connection was required establish a circuit mutually according to this demand from support equipment 15. In this way, the line connection by subscriber line extension is attained.

[0097] As for support equipment 15, the usual handover is performed, when the same as the base station controller 14 which had distributed the multicast packet before the base station controller 14 which has transmitted the distribution registration demand moving on the other hand (NO of step X2), and when the multicast packet demanded from the mobile station 11 is not the thing of the same class. That is, while setting up a channel between a mobile station 11 and the base station 13 of a migration place, the channel set up between the mobile station 11 and the base station of a moved material is made to release.

[0098] Thus, according to this operation-gestalt 6, since subscriber line extension is performing the line connection, unlike the case where a setup and release of a circuit by the mere handover are performed, a packet loss can be prevented at the time of migration between cels. Therefore, a mobile station 11 can receive a multicast packet continuously. Therefore, a mobile station 11 can receive quality distribution data. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0099] Gestalt 7, drawing 11 and drawing 12 of operation are a flow chart for explaining the transmitted power control processing in the mobile data communication system with which the migration communication system concerning the operation gestalt 7 of this invention is applied. In addition, in the following explanation, drawing 1 is referred to to coincidence.

[0100] It may become unnecessary distributing it, even if the mobile station 11 is carrying out distribution registration. Although this is determined by a user's volition, it does not necessarily perform a distribution registration deletion demand in this case. distribution registration is deleted — distribution — it is useless to continue distributing a multicast packet to the unnecessary mobile station 11, and it is inefficient. Then, he is trying for the ground equipment 12 side to check the existence of the need for distribution periodically in this operation gestalt 7 to the mobile station 11 which is carrying out distribution registration.

[0101] If it furthermore explains in full detail, support equipment 15 will transmit a question signal to a base station controller 14 periodically (step Y1 of drawing 1111 ). A question signal is for checking the existence of the need for distribution to the mobile station 11 registered into distribution registration table 15a. A base station controller 14 will transmit this question signal to a base station 13, if a question signal is received (step Y2). At this time, a base station controller 14 transmits a power measurement-request signal to a base station 13 with a question signal (step Y2). A power measurement-request signal requires measurement of power when the reply signal over a question signal is received in a base station 13.

[0102] A base station 13 will transmit a question signal to each mobile station 11 in a cel between these two received signals, if a question signal and a power measurement-request signal are received (step Y3). A mobile station 11 will transmit the reply signal which is the response to a question signal to a base station 13, if a question signal is received (step Y4).

[0103] A base station 13 will measure the power of the received reply signal based on the received-power measurement signal transmitted to old from the base station controller 14, if a reply signal is received (step Y5). A base station 13 adds the measurement power value concerned to a reply signal after power measurement, and transmits this reply signal to a base station controller 14 (step Y5).

[0104] A base station controller 14 receives the reply signal transmitted from the base station 13. Then, it distinguishes whether it is a thing to a question signal [ as opposed to / base station controller / 14 / which kind of multicast packet in a reply signal ] (step Y6).

[0105] As mentioned above, a question signal is transmitted periodically. Therefore, it always is not necessary to answer a letter to support equipment 15 in the reply signal over the multicast packet of the same class, and just once is enough as the reply signal over the multicast packet of one class. Therefore, the above distinction processings are performed.

[0106] If it is a reply signal over the multicast packet of a class which received to old (YES of step Y6), a base station controller 14 will not transmit a reply signal to support equipment 15. On the other hand, if it is a reply signal over the multicast packet of a class which received for the first time (NO of step Y6), a base station controller 14 will transmit a reply signal to support equipment 15 (step Y7).

[0107] Support equipment 15 will update the distribution registration situation of distribution registration table 15a according to the contents of a response, if a reply signal is received. When it is a reply signal that there is the need for distribution, specifically, as for support equipment 15, registration of the mobile station 11 concerned is maintained. In being a reply signal that there is no need for distribution, support equipment 15 eliminates registration of the mobile station concerned from distribution registration table 15a.

[0108] A base station controller 14 accumulates the received-power value included in a reply signal every base station 13 again (step Y8 of drawing 1212 ). A base station controller 14 distinguishes whether the reply signal was received from all the base stations 13 connected (step Y9). If a reply signal is received from all the base stations 13, a base station controller 14 will recognize the minimum received-power value among all received-power values (step Y10).

[0109] Then, a base station controller 14 computes the power value at the time of a multicast packet being transmitted from a base station 13 based on the minimum received-power value (step Y11). Specifically, a base station controller 14 computes the transmitted power value to which the minimum received-power value turns into a received-power value defined beforehand from the need of making sufficient received power receiving a multicast packet in a mobile station 11.

[0110] Then, a base station controller 14 is notified to all the base stations 13 connected so that a multicast packet may be distributed with this computed transmitted power value (step Y12). The base station 13 which received this notice distributes a multicast packet with the above-mentioned transmitted power value.

[0111] Thus, according to this operation gestalt 7, in case the existence of the need for distribution is checked, a base station controller 14 collects the received-power values in a base station 13, and is controlling the transmitted power of a base station 13 according to the minimum received-power value among this collected received-power value. Therefore, in all the mobile stations 11 that exist in the jurisdiction area of a base station controller 14, a multicast packet is receivable with sufficient received power. Therefore, quality multicast packet transmission is realizable. Therefore, the mobile data communication system whose system efficiency improved can be offered.

[0112] Seven operation gestalten of this invention have been explained more than other operation gestalt . However, of course, this invention can take other operation gestalten. For example, in the above-mentioned operation gestalt 1 thru/or 7, it is explaining taking the case of the case where IP packet communication system is applied as connectionless mode packet communication system. However, this invention is easily applicable also to other connectionless mode packet communication system, such as CLNP (Connection-Less Network Protocol) mold packet communication system.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the mobile data communication system with which the migration communication system concerning the operation gestalt 1 of this invention is applied.

[Drawing 2] It is the flow chart which shows processing of support equipment.

[Drawing 3] It is a flow chart for explaining distribution registration demand processing of the mobile station in the mobile data communication system with which the migration communication system concerning the operation gestalt 2 of this invention is applied.

[Drawing 4] It is the conceptual diagram showing the structure of a handover demand signal.

[Drawing 5] It is a flow chart for explaining distribution registration demand processing of the base station controller in the mobile data communication system with which the migration communication system concerning the operation gestalt 3 of this invention is applied.

[Drawing 6] It is the conceptual diagram showing the structure of a location registration demand signal.

[Drawing 7] It is a flow chart for explaining distribution registration demand processing of the mobile station in the mobile data communication system with which the migration communication system concerning the operation gestalt 4 of this invention is applied.

[Drawing 8] It is the conceptual diagram showing the structure of an information information signal.

[Drawing 9] It is a flow chart for explaining the processing at the time of distribution registration of the support equipment in the mobile data communication system with which the migration communication system concerning the operation gestalt 5 of this invention is applied.

[Drawing 10] It is a flow chart for explaining the processing at the time of distribution registration of the support equipment in the mobile data communication system with which the migration communication system concerning the operation gestalt 6 of this invention is applied.

[Drawing 11] It is a flow chart for explaining the transmitted power control processing in the mobile data communication system with which the migration communication system concerning the operation gestalt 7 of this invention is applied.

[Drawing 12] It is a flow chart for explaining the transmitted power control processing in the mobile data communication system with which the migration communication system concerning the operation gestalt 7 of this invention is applied, and processing of a continuation of drawing 11 is shown.

### [Description of Notations]

1 IP Packet Communication System

2 IP Terminal

10 Migration Communication System

11 Mobile Station

12 Ground Equipment

13 Base Station

14 Base Station Controller

15 Support Equipment

## 16 Gateway Unit

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[Translation done.]

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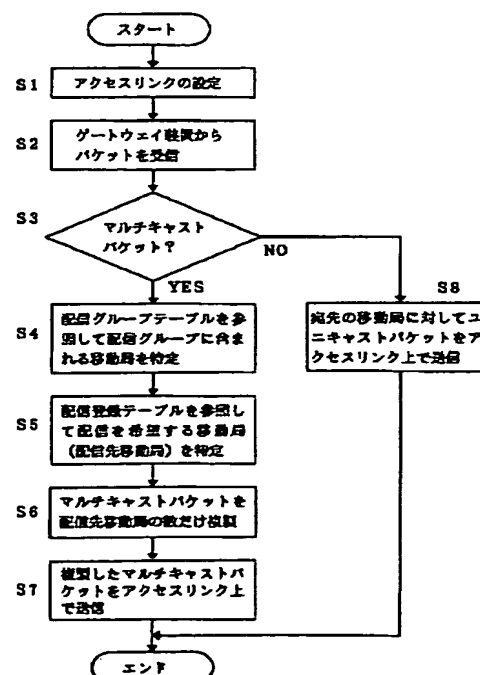
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(54) 【発明の名称】 移動通信システムおよび移動局

(57) 【要約】

【課題】 I P パケット通信網におけるマルチキャスト通信を移動通信に適用する場合において、システム効率の向上を図ることができる移動通信用マルチキャストパケット伝送システムを提供すること。

【解決手段】 I P パケット通信システムから送出された1つのマルチキャストパケットは、サポート装置に与えられる。サポート装置は、当該マルチキャストパケットを配信すべき移動局を特定し (S5)、この特定された配信先移動局の数に相当する数のマルチキャストパケットを作成するために、転送されてきたマルチキャストパケットを複製する (S6)。その後、サポート装置は、複製されたマルチキャストパケットをアクセスリンク上でフレーム単位で移動局に配信する。これにより、I P パケット通信システムからマルチキャストパケットを複製する場合に比べて、パケットの伝送効率の向上を図れる。



**【特許請求の範囲】**

【請求項1】 複数の移動局と、この複数の移動局と交信する複数の基地局と、この複数の基地局を管轄する基地局制御装置と、上記複数の移動局との間でアクセスリンクをそれぞれ設定する中継接続装置と、この中継接続装置とコネクションレス型パケット通信システムとの間に設けられ、上記中継接続装置との間でトンネリングにより通信するゲートウェイ装置とを備え、上記コネクションレス型パケット通信システムに備えられる端末から送信されるマルチキャストパケットを上記アクセスリンクを介して複数の移動局に伝送する機能を有する移動通信システムであって、

上記中継接続装置は、上記マルチキャストパケットを複製することにより、配信登録された移動局（以下「配信先移動局」という）の数に相当する数のマルチキャストパケットを作成する手段と、この作成されたマルチキャストパケットを上記配信先移動局に対して上記アクセスリンクを介して配信する手段とを含むものであることを特徴とする移動通信システム。

【請求項2】 請求項1において、上記移動局は、在圏エリアの変更を伴って移動する場合に、マルチキャストパケットの配信登録を位置登録またはハンドオーバーとともに制御チャネルを介して上記中継接続装置に要求する手段を含むものであることを特徴とする移動通信システム。

【請求項3】 請求項1または2において、上記基地局は、自局が形成するセルに移動してきた移動局に対して、自局が配信しているマルチキャストパケットに関する情報を報知チャネルを介して報知する手段を含むものであり、

上記移動局は、上記基地局から報知されるマルチキャストパケットに関する情報に基づいて、所望のマルチキャストパケットが配信されているか否かを判別する手段と、所望のマルチキャストパケットが配信されていないと判別された場合に、当該所望のマルチキャストパケットの配信登録を上記アクセスリンクを介して上記中継接続装置に要求する手段とを含むものであることを特徴とする移動通信システム。

【請求項4】 請求項1ないし3のいずれかにおいて、上記中継接続装置は、所定エリアごとに複数設けられており、上記移動局から配信登録が要求される場合に、当該要求に対応するマルチキャストパケットを配信しているか否かを判別する手段と、上記要求に対応するマルチキャストパケットを配信していないと判別された場合に、上記ゲートウェイ装置に対してマルチキャストパケットの配信登録を要求する手段をさらに含むものであり、

上記ゲートウェイ装置は、上記中継接続装置から配信登録要求がある場合に、当該要求に対応するマルチキャストパケットを当該要求をしてきた中継接続装置に配信す

る手段を含むものであることを特徴とする移動通信システム。

【請求項5】 請求項1ないし4のいずれかにおいて、当該移動通信システムは、CDMA (Code Division Multiple Access) を通信アクセス方式とするものであり、上記基地局制御装置は、上記複数の移動局に対して共通の無線リソース情報を割り当てる手段と、この割り当てられた無線リソース情報に基づいてマルチキャストパケットの配信を行うように上記制御対象の各基地局に対して通知する手段とを含むものであり、

上記基地局は、上記基地局制御装置から上記通知を受けた場合に、上記無線リソース情報に基づいてマルチキャストパケットを移動局に対して配信する手段を含むものであることを特徴とする移動通信システム。

【請求項6】 請求項1ないし5のいずれかにおいて、上記中継接続装置は、上記移動局が上記基地局制御装置の管轄エリアを変更する場合に、変更直前の基地局制御装置から変更直後の基地局制御装置に加入者線延長制御により回線を確保するように上記各基地局制御装置に対して通知する手段をさらに含むものであり、上記基地局制御装置は、上記中継接続装置の通知に基づいて、加入者線延長制御を実行することにより、回線を確保する手段を含むものであることを特徴とする移動通信システム。

【請求項7】 請求項1ないし6のいずれかにおいて、上記基地局制御装置は、上記マルチキャストパケットの配信の必要性の有無を確認する質問信号を基地局に対して送信する手段と、受信電力測定を指示する電力測定指示信号を上記基地局に送信する手段とを含むものであり、

上記基地局は、上記質問信号を上記移動局に対して送信する手段と、上記電力測定指示信号が受信された場合に、移動局から送信される応答信号の受信電力を測定する手段と、この測定された受信電力値を上記基地局制御装置に送信する手段とを含むものであり、

上記移動局は、上記質問信号の受信に対する応答信号を上記基地局に送信する手段を含むものであり、

上記基地局制御装置は、上記基地局から送信される受信電力値を保持する手段と、移動局に対してマルチキャストパケットを配信する際に、上記保持されている受信電力値に基づいて、基地局の送信電力を制御する手段とをさらに含むものであることを特徴とする移動通信システム。

【請求項8】 トンネリングにより伝送されてきたマルチキャストパケットを配信登録要求に基づいて登録された移動局の数だけ複製することにより作成された地上装置からのマルチキャストパケットをアクセスリンクを介して受信する移動局であって、

在圏エリアの変更を伴って移動する場合に、マルチキャストパケットの配信登録を位置登録またはハンドオーバー



とともに制御チャネルを介して要求する手段を含むことを特徴とする移動局。

【請求項9】 トンネリングにより伝送されてきたマルチキャストパケットを配信登録要求に基づいて登録された移動局の数だけ複製することにより作成された地上装置からのマルチキャストパケットをアクセスリンクを介して受信する移動局であって、受信したマルチキャストパケットに関する情報に基づいて、所望のマルチキャストパケットが配信されているか否かを判別する手段と、所望のマルチキャストパケットが配信されていないと判別された場合に、当該所望のマルチキャストパケットの配信登録を要求する手段とを含むことを特徴とする移動局。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 この発明は、セルラシステムなどの移動通信システムおよび移動局に関し、より詳細には、IP (Internet Protocol) パケット通信システムから送出される1つのマルチキャストパケットを複数の移動局に伝送するマルチキャストパケット伝送機能を有する移動通信システムおよび移動局に関する。

【0002】

【従来の技術】 従来、移動通信システムの無線回線を利用し、固定通信システムに含まれるコンピュータから移動通信システム内の移動局に対してパケットを伝送する移動データ通信システムが知られている。この移動データ通信システムには、移動通信システム内においていわゆるトンネリングによりパケット伝送を実現するものがある。

【0003】 より詳述すれば、この移動通信システムは、固定通信システムとの間のゲートとして機能するゲートウェイ装置と、移動通信システム内において位置登録エリアを管轄するサポート装置との間において、上記トンネリングによるパケット伝送を行っている。このトンネリングは、移動局の位置情報に基づいて確立される論理的な転送パス（トンネル）上でパケットを伝送するものである。これにより、移動していく移動局へのパケット伝送を可能としている。

【0004】 一方、internet/intranetに代表されるIP (Internet Protocol) パケット通信システムにおいては、従来から、いわゆるマルチキャスト通信が行われている。マルチキャスト通信は、1つのコンピュータから複数のコンピュータに対してマルチキャストパケットを伝送する。マルチキャスト通信の利用形態としては、会議中継などがある。

【0005】 IPパケット通信システムにおけるマルチキャスト通信は、IGMP (Internet Group Management Protocol) と呼ばれる制御手順に従って行われる。IGMPでは、IPパケット通信システム内のルータによっ

てマルチキャストパケットの伝送先が管理されるようになっている。すなわち、ルータは、伝送先が複数存在する場合、マルチキャストパケットを伝送先の数に相当する数だけ複製し、その結果得られたマルチキャストパケットを各伝送先に伝送する。

【0006】 ところで、このマルチキャスト通信を移動データ通信システムにおいて利用することができれば、ユーザにとっては非常に便利である。すなわち、外出先であっても、会議中継などを見ることができからである。そこで、移動データ通信システムにおいてもIPパケット通信システムにおけるマルチキャスト通信を利用する技術が望まれている。

【0007】

【発明が解決しようとする課題】 しかしながら、IPパケット通信システムにおけるマルチキャスト通信を上述のような移動データ通信システムにそのまま適用したのでは、パケット伝送効率、制御手順効率および無線回線における伝送効率などのシステム効率が十分でないおそれがある。

【0008】 そこで、この発明の目的は、IPパケット通信システムなどのコネクションレス型通信システムにおけるマルチキャスト通信を移動通信に適用する場合に、システム効率の向上を図ることができる移動通信システムおよび移動局を提供することである。

【0009】

【課題を解決するための手段】 上記目的を達成するためのこの発明は、複数の移動局と、この複数の移動局と通信する複数の基地局と、この複数の基地局を管轄する基地局制御装置と、上記複数の移動局との間でアクセスリンクをそれぞれ設定する中継接続装置と、この中継接続装置とコネクションレス型パケット通信システムとの間に設けられ、上記中継接続装置との間でトンネリングにより通信するゲートウェイ装置とを備え、上記コネクションレス型パケット通信システムに備えられる端末から送信されるマルチキャストパケットを上記アクセスリンクを介して複数の移動局に伝送する機能を有する移動通信システムであって、上記中継接続装置は、上記マルチキャストパケットを複製することにより、配信登録された移動局（以下「配信先移動局」という）の数に相当する数のマルチキャストパケットを作成する手段と、この作成されたマルチキャストパケットを上記配信先移動局に対して上記アクセスリンクを介して配信する手段とを含むものであることを特徴とする移動通信システムである。

【0010】 また、この発明は、上記移動局が、在圏エリアの変更を伴って移動する場合に、マルチキャストパケットの配信登録を位置登録またはハンドオーバーとともに制御チャネルを介して上記中継接続装置に要求する手段を含むものであることを特徴とする移動通信システムである。

【0011】さらに、この発明は、上記基地局が、自局が形成するセルに移動してきた移動局に対して、自局が配信しているマルチキャストパケットに関する情報を報知チャネルを介して報知する手段を含むものであり、上記移動局が、上記基地局から報知されるマルチキャストパケットに関する情報に基づいて、所望のマルチキャストパケットが配信されているか否かを判別する手段と、所望のマルチキャストパケットが配信されていないと判別された場合に、当該所望のマルチキャストパケットの配信登録を上記アクセスリンクを介して上記中継接続装置に要求する手段とを含むものであることを特徴とする移動通信システムである。

【0012】さらにまた、この発明は、上記中継接続装置が、所定エリアごとに複数設けられており、上記移動局から配信登録が要求される場合に、当該要求に対応するマルチキャストパケットを配信しているか否かを判別する手段と、上記要求に対応するマルチキャストパケットを配信していないと判別された場合に、上記ゲートウェイ装置に対してマルチキャストパケットの配信登録を要求する手段をさらに含むものであり、上記ゲートウェイ装置が、上記中継接続装置から配信登録要求がある場合に、当該要求に対応するマルチキャストパケットを当該要求をしてきた中継接続装置に配信する手段を含むものであることを特徴とする移動通信システムである。

【0013】さらに、この発明は、当該移動通信システムが、CDMA (Code Division Multiple Access) を通信アクセス方式とするものであり、上記基地局制御装置が、複数の移動局に対して共通の無線リソース情報を割り当てる手段と、この割り当てられた無線リソース情報に基づいてマルチキャストパケットの配信を行うように上記制御対象の各基地局に対して通知する手段とを含むものであり、上記基地局が、上記基地局制御装置から上記通知を受けた場合に、上記無線リソース情報に基づいてマルチキャストパケットを移動局に対して配信する手段を含むものであることを特徴とする移動通信システムである。

【0014】さらにまた、この発明は、上記中継接続装置が、上記移動局が上記基地局制御装置の管轄エリアを変更する場合に、変更直前の基地局制御装置から変更直後の基地局制御装置に加入者線延長制御により回線確保するように上記各基地局制御装置に対して通知する手段をさらに含むものであり、上記各基地局制御装置が、上記中継接続装置の通知にตอบสนองして、加入者線延長制御を実行することにより、回線確保する手段を含むものであることを特徴とする移動通信システムである。

【0015】さらに、この発明は、上記基地局制御装置が、上記マルチキャストパケットの配信の必要性の有無を確認する質問信号を基地局に対して送信する手段と、受信電力測定を指示する電力測定指示信号を上記基地局に送信する手段とを含むものであり、上記基地局は、上

記質問信号を上記移動局に対して送信する手段と、上記電力測定指示信号が受信された場合に、移動局から送信される応答信号の受信電力を測定する手段と、この測定された受信電力値を上記基地局制御装置に送信する手段とを含むものであり、上記移動局が、上記質問信号の受信に対する応答信号を上記基地局に送信する手段を含むものであり、上記基地局制御装置が、上記基地局から送信される受信電力値を保持する手段と、移動局に対してマルチキャストパケットを配信する際に、上記保持されている受信電力値に基づいて、基地局の送信電力を制御する手段とをさらに含むものであることを特徴とする移動通信システムである。

【0016】さらにまた、この発明は、トンネリングにより伝送されてきたマルチキャストパケットを配信登録要求に基づいて登録された移動局の数だけ複製することにより作成された地上装置からのマルチキャストパケットをアクセスリンクを介して受信する移動局であって、在圏エリアの変更を伴って移動する場合に、マルチキャストパケットの配信登録を位置登録またはハンドオーバーとともに制御チャネルを介して要求する手段を含むことを特徴とする移動局である。

【0017】さらに、この発明は、トンネリングにより伝送されてきたマルチキャストパケットを配信登録要求に基づいて登録された移動局の数だけ複製することにより作成された地上装置からのマルチキャストパケットをアクセスリンクを介して受信する移動局であって、受信したマルチキャストパケットに関する情報に基づいて、所望のマルチキャストパケットが配信されているか否かを判別する手段と、所望のマルチキャストパケットが配信されていないと判別された場合に、当該所望のマルチキャストパケットの配信登録を要求する手段とを含むことを特徴とする移動局である。

【0018】

【発明の実施の形態】以下では、この発明の実施の形態を、添付図面を参照して詳細に説明する。

【0019】なお、以下の実施形態1ないし7は、それぞれ異なるシステムの構成であってもよく、また、1つのシステムにおける各機能にそれぞれ対応するものであってもよい。

【0020】実施の形態1. 図1は、この発明の実施形態1に係る移動通信システムが適用される移動データ通信システムの構成を示すブロック図である。この移動データ通信システムは、IP (Internet Protocol) パケット通信システム1および移動通信システム10を備えている。この移動データ通信システムは、IPパケット通信システム1内のIP端末2から送出されるマルチパケットを移動通信システム10内の複数の移動局11に対して同時に伝送する。

【0021】IPパケット通信システム1は、コネクションレス型のパケット通信システムであって、複数の1

P端末2、複数のルータ3およびゲートウェイ装置(GW)4を備えている。IP端末2は、パーソナルコンピュータ、ワークステーションおよびサーバなどで構成され、IPを実装している。ゲートウェイ装置4は、IPパケット通信システム1と移動通信システム10との間でIPパケット通信システム1側のゲートとして機能する。

【0022】IP端末2は、送信データを複数のパケットに分割して送出する。各パケットは、ヘッダ部およびデータ部からなる。ヘッダ部は、移動局11に対して送信データを送信する場合、移動局11を特定するIPアドレスを含む。たとえば、ヘッダ部は、1つの移動局11を特定するユニキャストアドレスまたは2以上の移動局11を含む1つの配信グループを特定するマルチキャストアドレスを含む。なお、以下では、ユニキャストアドレスをヘッダ部に含むパケットをユニキャストパケットと呼び、マルチキャストアドレスをヘッダ部に含むパケットをマルチキャストパケットと呼ぶ。

【0023】ルータ3は、IP端末2から送出されたパケットを中継する。ルータ3から送出されたマルチキャストパケットは、ゲートウェイ装置4に与えられる。ゲートウェイ装置4は、宛先のIPアドレスから在圏網を特定するなどの処理を与えられたパケットに対して施した後、移動通信システム10に送出する。

【0024】移動通信システム10は、移動局11および地上装置12を備えている。移動通信システム10は、移動局11と地上装置12との間の通信アクセス方式としてCDMA(Code Division Multiple Access)を用いている。すなわち、移動局11および地上装置12内の基地局13においては、送信データに対してQPSK(Quadrature Phase Shift-Keying)など所定の一次変調方式による一次変調を施して一次変調信号を作成する。その後、この作成された一次変調信号に対して各ユーザ固有の拡散コードを用いた二次変調を施して二次変調信号を作成する。そして、この作成された二次変調信号に基づく電波を放射する。このようにして、移動局11と地上装置12との間の通信が達成される。

【0025】移動局11は、ノート型パーソナルコンピュータなどの携帯可能なコンピュータ端末11aおよび移動機11bを有している。移動機11bは、データ通信可能な電話機から構成される。具体的には、移動機11bは、携帯電話機およびPHS(Personal Handyphone System)電話機などから構成される。使用時においては、移動機11bをコンピュータ端末11aに接続する。なお、移動局11は、単体で、データ通信が可能なものから構成されていてもよい。

【0026】地上装置12は、複数の基地局13、複数の基地局制御装置14、複数のサポート装置15、ゲートウェイ装置(GW)16およびホームポジションレジスタ17を備えている。基地局13は、複数(たとえば

3つ)のセクタからなるセルを形成し、このセル内に存在する移動局11と交信する。基地局制御装置14は、複数の基地局13に接続され、当該接続された各基地局13により形成される各セルからなる管轄エリアを管轄する。

【0027】サポート装置15は、たとえば、移動局11の位置を把握する最小単位である位置登録エリアごとに設けられる。位置登録エリアは、複数のセルから構成される。サポート装置15は、ホームポジションレジスタ17、ゲートウェイ装置16、および、位置登録エリア内に設けられたすべての基地局制御装置14に接続されている。サポート装置15は、移動局11との間でアクセスリンクを設定する機能を有する。アクセスリンクは、サポート装置15と移動局11との間におけるパケット伝送時の論理的な通信路で、各移動局11ごとに、またQOS(Quality Of Service)クラスごとに複数設定される。このアクセスリンクは、QOSに合わせて、誤り制御(たとえばARQ;自動再送による誤り回復)などの機能を有する。

【0028】サポート装置15は、配信登録テーブル15aを有している。配信登録テーブル15aは、アクセスリンク、すなわち移動局11と、当該移動局11が配信を要求しているマルチキャストパケットを転送するための論理的な通信路との対応関係を示すものである。サポート装置15は、この配信登録テーブル15aを参照することにより、マルチキャストパケットを配信すべき配信先移動局を特定する。また、サポート装置15は、移動局11から配信登録の要求/解除を受け付けることにより、配信登録テーブル15aの内容を更新する。

【0029】配信登録テーブル15aへの登録は、たとえば、移動局11から配信登録要求信号を地上装置12に送信することにより行われる。具体的には、移動局11は、配信登録要求信号を基地局13に対して送信する。基地局13は、配信登録要求信号を基地局制御装置14に転送する。基地局制御装置14は、受信された配信登録要求信号をサポート装置15に転送する。サポート装置15は、配信登録を要求してきた移動局11(アクセスリンク)と配信すべきマルチキャストパケットとを対応付けて配信登録テーブル15aに登録する。

【0030】ホームポジションレジスタ17は、移動局11の加入者データを記憶する。加入者データは、固有の加入者番号、移動局の現在位置および配信グループテーブルを含む。配信グループテーブルは、移動局11と配信グループとの対応関係を示すものである。

【0031】ゲートウェイ装置16は、IPパケット通信システム1のゲートウェイ装置4に接続されている。また、ゲートウェイ装置16は、ホームポジションレジスタ17にも接続されている。ゲートウェイ装置16は、IPパケット通信システム1との間で移動通信システム10側のゲートとして機能する。具体的には、ゲー

トウエイ装置16は、ホームポジションレジスタ17に記憶されている加入者データに基づき、IPパケット通信システム1から送出されるパケットの伝送先をルーティングする。

【0032】ゲートウェイ装置16とサポート装置15とは、いわゆるトンネリングによりデータ伝送を行う。より具体的には、たとえばゲートウェイ装置16からサポート装置15に対してマルチキャストパケットを転送する場合、ゲートウェイ装置16は、サポート装置15との間に論理的な転送パス(トンネル)を形成する。そして、マルチキャストパケットをこの形成された転送パス上で送信する。このように、この実施形態1では、ゲートウェイ装置16およびサポート装置15がそれぞれトンネルの始点および終点となっている。

【0033】図2は、サポート装置15の処理を示すフローチャートである。マルチキャストパケットを移動局11に配信するためには、移動局11とサポート装置15との間にアクセスリンクを設定しておく必要がある。そこで、移動局11は、電源投入後、地上装置12のサポート装置15に対してアクセスリンクの設定を要求する。これにตอบสนองして、サポート装置15は、移動局11との間にアクセスリンクを設定する(ステップS1)。

【0034】IPパケット通信システム1内のIP端末2からマルチキャストパケットが送出されると、当該マルチキャストパケットは、ルータ3およびゲートウェイ装置4を介して移動通信システム10に送出される。

【0035】IPパケット通信システム1から送出されたマルチキャストパケットは、ゲートウェイ装置16において受信される。ゲートウェイ装置16は、受信されたマルチキャストパケットのマルチキャストアドレスおよびホームポジションレジスタ17に記憶されている加入者データに基づいて、マルチキャストパケットを配信すべきサポート装置15を決定する。具体的には、ゲートウェイ装置16は、配信グループテーブルを参照することにより、当該マルチキャストアドレスに対応する配信グループにいずれの移動局11が含まれているかを決定する。

【0036】さらにゲートウェイ装置16は、加入者データに含まれる現在位置データに基づいて、配信グループに含まれる移動局11が存在する位置登録エリアを認識する。その後、ゲートウェイ装置16は、この認識された位置登録エリアに対応するサポート装置15を転送先として決定する。

【0037】ゲートウェイ装置16は、転送先として決定されたサポート装置15に対してマルチキャストパケットをトンネリングにより転送する。この場合、複数のサポート装置15を転送先として決定した場合には、ゲートウェイ装置16は、マルチキャストパケットをサポート装置15の数だけ複製し、この複製マルチキャストパケットをそれぞれのサポート装置15にトンネリング

により転送する。

【0038】サポート装置15は、ゲートウェイ装置16からパケットを受信すると(ステップS2)、受信されたパケットがマルチキャストパケットであるか否かを判別する(ステップS3)。マルチキャストパケットであれば、サポート装置15は、当該マルチキャストパケットを配信すべきグループに含まれる移動局11を特定する(ステップS4)。具体的には、サポート装置15は、転送されてきたマルチキャストパケットに含まれるマルチキャストアドレス、ホームポジションレジスタ17に記憶されている配信グループテーブルに基づいて、配信グループおよびその配信グループに含まれる移動局11を特定する。

【0039】その後、サポート装置15は、配信登録テーブル15aを参照し、上記特定された移動局11のうち配信を希望するとして配信登録テーブル15aに登録されている移動局(以下「配信先移動局」という。)11を特定する(ステップS5)。そして、サポート装置15は、配信先移動局11の数に相当する数のマルチキャストパケットを作成するために、受信されたマルチキャストパケットを複製する(ステップS6)。すなわち、トンネリングのための転送パスの終点であり、かつ移動局11との間でアクセスリンクが設定されるサポート装置15において、マルチキャストパケットの複製が行われる。

【0040】その後、この複製された各マルチキャストパケットを配信先移動局11に対してアクセスリンク上で送信する(ステップS7)。具体的には、サポート装置15は、配信先移動局11が存在する管轄エリアを管轄する基地局制御装置14を特定し、当該特定された基地局制御装置14に対して複製後のマルチキャストパケットをアクセスリンク上でフレーム単位で送信する。

【0041】基地局制御装置14は、送信されてきたマルチキャストパケットを配信先移動局11が存在するセルを形成している基地局13に対してアクセスリンク上で送信する。基地局13は、送信されてきたマルチキャストパケットに基づく電波をセルに放射する。これにより、移動局11は、マルチキャストパケットを受信することができる。

【0042】なお、ステップS3の判別処理において、マルチキャストパケットでない場合には、ユニキャストパケットであると考えられるから、サポート装置15は、ユニキャストパケットを、宛先となる移動局11に対してアクセスリンクを介して送信する(ステップS8)。

【0043】以上のようにこの実施形態1によれば、ゲートウェイ装置16との間でトンネリングによる通信を行う際の転送パスの終点であり、かつ移動局11との間で固有のアクセスリンクが設定されるサポート装置15においてマルチキャストパケットを複製するようにして

いる。

【0044】したがって、伝送されるマルチキャストパケットは、IPパケット通信システム1内はもちろん、ゲートウェイ装置16とサポート装置15との間の伝送区間においても、1つである。そのため、IPパケット通信システム1においてマルチキャストパケットを複製する場合に比べて、マルチキャストパケットを効率良く伝送することができる。ゆえに、システム効率が向上された移動データ通信システムを提供することができる。

【0045】実施の形態2。図3は、この発明の実施形態2に係る移動通信システムが適用される移動データ通信システムにおける移動局11の配信登録要求処理を説明するためのフローチャートである。以下の説明では、図1を同時に参照する。

【0046】この実施形態2では、移動局11がマルチキャストパケットを受信中に別の位置登録エリアに移動する場合の配信登録要求処理について説明する。移動局11は、位置登録エリアを亘った移動をする場合、移動先の位置登録エリアを管轄するサポート装置15に対して配信登録を改めて要求する必要がある。この場合、移動局11は、配信登録を通信チャンネルを介して地上装置12に要求することが考えられる。

【0047】しかし、この場合、地上装置12は、配信登録の完了を待ってからマルチキャストパケットの配信を開始しなければならず、マルチキャストパケットの配信が行われるまで時間がかかるおそれがある。そこで、この実施形態2では、移動局11がセル間を移動する場合に制御チャンネルを利用してハンドオーバー要求を行うことを考慮し、このハンドオーバー要求と併せて配信登録を要求するようにしている。

【0048】より詳述すれば、基地局制御装置14は、管轄するすべての基地局13に対して報知情報の提供を常時指示する。報知情報は、空きチャンネル情報を含むものである。基地局13は、受信された報知情報を含む電波をセルに向けて報知チャンネルを介して放射している。こうして、自セルに移動してくる移動局11に対して空きチャンネルを常時知らせている。

【0049】一方、移動局11は、マルチキャストパケットを受信している場合、在圏セルを変更するかどうかを常時監視している。具体的には、移動局11は、受信電波の品質（たとえば受信レベル）を検出する（ステップT1）。また、移動局11は、この検出された品質が所定のしきい値未満まで低下したかどうかを判別する（ステップT2）。しきい値は、通信に必要な最低限の受信品質に相当する値に設定されている。品質が上記しきい値未満まで低下すれば、セルの境界に近づいてきたと考えられるから、移動局11は、キャリアセンスを実行する（ステップT3）。キャリアセンスは、良好な受信状態を得るために、隣接セルで使用されている周波数を検出する処理である。

【0050】周波数が検出されると、移動局11は、この検出された周波数に対応するチャンネルが空いているかどうかを判別する（ステップT4）。具体的には、移動局11は、検出された周波数に対応するチャンネルと受信された報知情報の空きチャンネルとを比較する。検出された周波数に対応するチャンネルが空きチャンネルでなければ（ステップT4のNO）、移動局11は、別のチャンネルを特定すべく、ステップT3におけるキャリアセンスを再度実行する。一方、検出された周波数に対応するチャンネルが空きチャンネルであれば（ステップT4のYES）、移動局11は、通信チャンネルをこの空きチャンネルに切り替えるべく、ハンドオーバー要求信号を移動先の基地局13に対して制御チャンネルを介して送信する（ステップT5）。制御チャンネルとしては、CCH(Common Control Channel)などを適用することができる。

【0051】ハンドオーバー要求信号は、図4に示すように、配信関連データを含む。配信関連データは、種別データおよびアドレスデータを含む。種別データは、配信の要求/取消を指定する。アドレスデータは、配信の要求/取消を希望するIPアドレス（マルチキャストアドレス）を指定する。その他、ハンドオーバー要求信号は、メッセージ種別データ、ランダムアクセス番号データ、管轄エリアデータおよび位置登録エリアデータを含む。メッセージ種別データは、ハンドオーバー要求を指定するものである。

【0052】基地局13は、受信したハンドオーバー要求信号を、自局が接続されている基地局制御装置14に転送する。基地局制御装置14は、ハンドオーバー要求信号を受信すると、このハンドオーバー要求信号を、自装置が接続されているサポート装置15に転送する。その結果、サポート装置15は、ハンドオーバー要求信号を受信する。

【0053】サポート装置15は、ハンドオーバー要求信号を受信すると、当該ハンドオーバー要求信号に含まれているデータを認識する。配信関連データが含まれていなければ、サポート装置15は、ハンドオーバー要求信号を送信してきた基地局制御装置14に対してハンドオーバーを指示する。

【0054】基地局制御装置14は、このハンドオーバーの指示に従って、移動先の基地局13に対してチャンネル設定を指示するとともに、移動元の基地局13に対してチャンネル解放を指示する。こうして、ハンドオーバーが達成される。

【0055】一方、配信関連データが含まれていれば、サポート装置15は、当該ハンドオーバー要求信号を送信してきた移動局11を、ハンドオーバー要求信号が送信されてきたアクセスリンクがいずれであるかに基づいて特定する。その後、サポート装置15は、配信登録テーブル15aにアクセスし、当該移動局11に対応するアクセスリンクを登録する。こうして、配信登録が達成され

る。

【0056】このようにこの実施形態2によれば、移動局11は、ハンドオーバーの要求と同時に配信登録を制御チャネルを介して要求している。したがって、配信登録要求を通信チャネルを介して行う場合に比べて、パケット伝送の効率化を図ることができる。そのため、システム効率が向上された移動データ通信システムを提供することができる。

【0057】実施の形態3、図5は、この発明の実施形態3に係る移動通信システムが適用される移動データ通信システムにおける基地局制御装置14の配信登録要求処理を説明するためのフローチャートである。なお、以下の説明では、図1を同時に参照する。

【0058】上記実施の形態2では、マルチキャストパケットを受信中に別の位置登録エリアに移動する場合を想定している。これに対して、この実施形態3では、マルチキャストパケットを受信していない状態で、別の位置登録エリアに移動する場合を想定している。

【0059】このような場合、移動局11は、ハンドオーバーではなく、新たな位置登録エリアにおいて位置登録を要求する必要がある。この位置登録要求は、通常、SCCHなどの制御チャネルを利用して行われる。そこで、このような場合、移動局11において、位置登録要求と併せて配信登録要求を行うようにしている。

【0060】具体的には、移動局11は、位置登録要求信号を移動先のセルを管轄する基地局13に送信する。位置登録要求信号は、図6に示すように、メッセージ種別、ユーザID、位置登録エリアデータおよび配信関連データを含む。メッセージ種別は、位置登録を要求することを指定する。配信関連データは、図4に示されたハンドオーバー要求信号中の配信関連データと同様に、種別データおよびアドレスデータを含むものである。

【0061】基地局13は、受信した位置登録要求信号を、自局が接続されている基地局制御装置14に転送する。その結果、基地局制御装置14は、位置登録要求信号を受信する(ステップU1)。基地局制御装置14は、受信された位置登録要求信号をサポート装置15に転送する(ステップU2)。

【0062】サポート装置15は、位置登録要求に従って、ホームポジションレジスタ17にアクセスし、当該移動局11の現在位置を新たな位置に変更する。これにより、位置登録が達成される。また、サポート装置15は、配信登録テーブル15aにアクセスし、当該移動局11との間で設定されているアクセスリンクを登録する。こうして、配信登録が達成される。

【0063】位置登録および配信登録が行われると、サポート装置15は、位置登録および配信登録を行ったことを示す応答信号を基地局制御装置14に送信する。基地局制御装置14は、応答信号を受信すると、マルチキャストパケットの配信に必要な無線リソース情報を応答

信号に含ませる(ステップU3)。その後、基地局制御装置14は、無線リソース情報を含む応答信号を基地局13に送信する(ステップU4)。

【0064】無線リソース情報は、マルチキャストパケットの配信に使用される無線周波数、拡散コードおよびセクタ番号を含む。この場合、無線リソース情報は、移動局11に対して個別に割り当てるのではなく、同じマルチキャストパケットに関して配信登録を行っている複数の移動局11に対して共通に割り当てる。たとえば、同じマルチキャストパケットの配信登録を行っている他の移動局11が移動先の位置登録エリアにすでに存在する場合には、当該他の移動局11との無線通信に使用されている無線リソース情報を割り当てる。

【0065】基地局13は、応答信号を受信すると、この受信された応答信号に含まれる無線リソース情報に基づいて、無線区間の送信制御を実行する。具体的には、基地局13は、無線リソース情報に含まれる周波数に基づいて一次変調信号を作成し、さらに無線リソース情報に含まれる拡散コードに基づいて二次変調信号を作成した後、無線リソース情報に含まれるセクタ番号に対応するセクタに対して、二次変調信号に基づく電波を放射する。

【0066】以上のようにこの実施形態3によれば、配信登録要求を制御チャネルを介して行うようにしている。したがって、配信登録要求を通信チャネルを介して行う場合に比べて、システム効率が向上された移動データ通信システムを提供することができる。

【0067】また、マルチキャストパケットの配信登録を行う場合に、他の移動局11と共通の無線リソース情報を割り当てている。したがって、無線リソースの有効利用を図ることができる。そのため、システム効率が向上された移動データ通信システムを提供することができる。

【0068】実施の形態4、図7は、この発明の実施形態4に係る移動通信システムが適用される移動データ通信システムにおける移動局11の配信登録要求処理について説明するためのフローチャートである。なお、以下の説明では、図1を同時に参照する。

【0069】この実施形態4では、移動局11がマルチキャストパケットを受信中にセル間を移動する場合の配信登録要求処理について説明する。移動局11がセル間を移動する場合、移動先のセルに、受信中のマルチキャストパケットと同じ種類のマルチキャストパケットが配信されているか否かは不明である。したがって、セル間を移動する場合には常に移動局11から地上装置12に対して配信登録を要求することが考えられる。

【0070】しかし、移動先のセルに自局と同じ配信グループに含まれる移動局11がすでに存在する場合には、受信中のマルチキャストパケットと同じ種類のマルチキャストパケットが移動先のセルにすでに配信されて

いるときがある。そこで、この実施形態4では、このようなときを考慮し、移動先のセルに受信中のマルチキャストパケットが配信されていない場合に限って、移動局11から地上装置12に対して配信登録を要求するようにしている。

【0071】より詳述すれば、基地局13は、マルチキャストパケットを配信する場合、報知情報信号をセルに向かって報知チャネルを介して送信している。これにより、当該セルに移動してきた移動局11に対して、配信を希望するマルチキャストパケットが当該セルに配信されているのか否かを知らせている。

【0072】報知チャネルとしては、BCCH(Broadcast Control Channel)などを適用することができる。この場合におけるBCCHは、ネットワークID、セルIDおよび論理チャネル構成などのシステム全般に関する情報を報知するものではなく、マルチキャストパケットの配信に関する情報を報知するためのものである。

【0073】報知情報信号は、図8(a)に示すように、パケット関連情報を含む。パケット関連情報は、図8(b)に示すように、メッセージ種別、情報要素長、位置登録エリア、周波数帯域、拡散情報およびアドレス情報の各データを含む。

【0074】メッセージ種別データは、移動局11に送信されるメッセージの種別を指定する。具体的には、どのような情報要素または情報要素群が移動局11に送信されるメッセージに含まれているかを指定する。情報要素長は、移動局11に送信されるメッセージ長を指定する。周波数帯域および拡散情報の各データは、複数の移動局11で共有するマルチキャストパケットを配信するための下り(基地局13→移動局11)の方向のチャネルに関する周波数帯域および拡散情報を指定する。アドレス情報は、現在配信を行っているマルチキャストパケットに関する情報を指定する。当該情報は、アドレス情報、および、マルチキャストパケットを受信する移動局群(配信グループ)を識別するためのパケットIDを含む。

【0075】なお、報知情報信号は、パケット関連情報の他に、図8(a)に示すように、BCCH識別情報、送信電力情報、上り干渉量およびCRC(Cyclic Redundancy Check)を含む。

【0076】図7に戻って、移動局11は、マルチキャストパケットを受信中にセル間を移動する場合、移動先のセルを形成している基地局13から報知チャネルを介して送信されている報知情報信号を受信する(ステップV1)。その後、移動局11は、受信された報知情報信号に含まれるパケット関連情報を確認し(ステップV2)、自局が受信中のマルチキャストパケットと同じマルチキャストパケットが移動先の基地局13から配信されているか否かを判別する(ステップV3)。

【0077】配信されていないならば(ステップV3のN

O)、移動局11は、配信登録要求信号を基地局13に対して送信する(ステップV4)。その後は上記実施形態2の場合と同様に、配信登録要求信号が基地局13から基地局制御装置14を経てサポート装置15に転送され、サポート装置15において配信登録テーブル15aが更新されることにより、配信登録が達成される。

【0078】一方、配信されていれば(ステップV3のYES)、移動局11は、配信登録要求信号は送信しない。しかし、この場合であっても、移動前の配信登録テーブル15aの登録状況から当該移動局11は配信登録を希望していることがわかる。したがって、移動局11は、受信中のマルチキャストパケットと同じ種類のマルチキャストパケットを引き続き受信することができる。

【0079】このようにこの実施形態4によれば、移動局11は、セル間を移動する際に、自局が受信しているマルチキャストパケットと同じ種類のマルチキャストパケットが移動先の基地局13から配信されていない場合に限って、配信登録の要求を地上装置12に対して行うようにしている。したがって、すでに配信されている場合にも配信登録要求を行う場合に比べて、地上装置12における信号処理が簡単になる。そのため、信号処理の効率を向上できる。

【0080】なお、配信登録を要求する場合、上記実施形態2と同様に、ハンドオーバー要求とともに制御チャネルを介して配信登録を要求するようにしてもよい。この場合には、上記実施形態2と同様に、パケット伝送効率の向上を図ることができる。

【0081】実施の形態5。図9は、この発明の実施形態5に係る移動通信システムが適用される移動データ通信システムにおけるサポート装置15の配信登録時の処理を説明するためのフローチャートである。なお、以下の説明では、図1を同時に参照する。

【0082】この実施形態5では、移動局11から地上装置12に対して配信登録が要求されてきた場合におけるサポート装置15の処理について説明する。移動局11は、別の位置登録エリアに移動する場合がある。この場合、異なるサポート装置15と通信を行うことになるから、移動局11は、マルチキャストパケットの配信登録を改めて要求する必要がある。

【0083】自局と同じ種類のマルチキャストパケットの配信を希望する移動局が移動先の位置登録エリア内に存在している場合、移動局11は、上記の配信登録要求を行うだけで、所望のマルチキャストパケットを受信することができる。すなわち、移動先のセルにおいて所望のマルチキャストパケットがすでに配信されているからである。

【0084】一方、自局と同じ種類のマルチキャストパケットの配信を希望する移動局11が移動先の位置登録エリア内に存在していない場合、ゲートウェイ装置16は、当該位置登録エリアを管轄するサポート装置15に

マルチキャストパケットを送信していない。したがって、マルチキャストパケットは、当該位置登録エリア内のいずれのセルにも配信されていないことになる。そのため、サポート装置 15 は、移動局 11 から配信登録を受け付けても、配信要求に応じたマルチキャストパケットを移動局 11 に対して配信することができない。

【0085】そこで、この実施形態 5 では、このような場合を考慮し、サポート装置 15 においてマルチキャストパケットの配信状況を調べ、マルチキャストパケットを移動局 11 に対して配信できるようにしている。

【0086】より詳述すれば、移動局 11 からの配信登録要求信号が受信された場合（ステップ W1）、サポート装置 15 は、要求に応じたマルチキャストパケットを配信しているか否かを判別する。具体的には、サポート装置 15 は、配信関連データに含まれるアドレスデータに基づいて、移動局 11 が要求しているマルチキャストパケットを確認する（ステップ W2）。次いで、サポート装置 15 は、配信登録を要求してきた移動局 11 が配信登録テーブル 15a に登録されているか否かを判別する（ステップ W3）。

【0087】登録されていれば（ステップ W3 の YES）、移動局 11 は別の位置登録エリアから移動してきたものではなく、同じ位置登録エリア内において新規に配信登録を要求してきたものであると考えられる。したがって、この場合、サポート装置 15 は、通常どおり、当該移動局 11 を配信登録テーブル 15a に登録する。その結果、移動局 11 は、サポート装置 15 から配信されているマルチキャストパケットを受信することができる。一方、登録されていなければ（ステップ W3 の NO）、サポート装置 15 は、配信登録を要求してきた移動局 11 を配信登録テーブル 15a に登録する（ステップ W4）。

【0088】次に、サポート装置 15 は、当該配信登録要求に対応するマルチキャストパケットを配信しているか否かを判別する（ステップ W5）。マルチキャストパケットが配信されていれば（ステップ W5 の YES）、サポート装置 15 は、その配信されているマルチキャストパケットを、配信登録を要求してきた移動局 11 に対して配信すべく、基地局制御装置 14 に送信する。一方、マルチキャストパケットが配信されていなければ（ステップ W5 の NO）、サポート装置 15 は、当該マルチキャストパケットを配信するように、ゲートウェイ装置 16 に対して要求する（ステップ W6）。

【0089】ゲートウェイ装置 16 は、サポート装置 15 から配信要求されると、要求に応じたマルチキャストパケットを複製し、その複製されたマルチキャストパケットを、配信要求をしてきたサポート装置 15 に送信する。これにより、サポート装置 15 は、要求に応じたマルチキャストパケットを、配信登録を要求してきた移動局 11 に対して配信することができる。

【0090】このようにこの実施形態 5 によれば、サポート装置 15 は、移動局 11 からマルチキャストパケットの配信登録要求があった場合、ゲートウェイ装置 16 からマルチキャストパケットの配信を受けていないときに限って、マルチキャストパケットの配信をゲートウェイ装置 16 に対して要求する。

【0091】したがって、この場合を想定し、ゲートウェイ装置 16 から予めすべてのサポート装置 15 に対してマルチキャストパケットの配信を行う場合に比べて、ゲートウェイ装置 16 およびサポート装置 15 における処理を簡単にすることができる。そのため、処理効率の向上された移動データ通信システムとすることができる。

【0092】実施の形態 6。図 10 は、この発明の実施形態 6 に係る移動通信システムが適用される移動データ通信システムにおけるサポート装置 15 の配信登録時の処理を説明するためのフローチャートである。なお、以下の説明では、図 1 を同時に参照する。

【0093】この実施形態 6 では、移動局 11 がマルチキャストパケットを受信中にセル間を移動する場合において、移動局 11 から配信登録が要求されてきたときに、サポート装置 15 および基地局制御装置 14 において行われる加入者線延長制御について説明する。移動局 11 がマルチキャストパケットを受信中にセル間を移動する場合、単にハンドオーバーによる回線の設定および解放を行うことが考えられる。しかし、この場合、一瞬とは言えども回線が絶たれるから、パケットロスが発生するおそれがある。そこで、この実施形態 6 では、回線が瞬断されることのない加入者線延長制御によりチャネル切り替えを実現している。

【0094】より詳述すれば、移動局 11 は、セル間を移動する場合、配信登録要求信号を基地局 13 に対して送信する。基地局 13 は、受信された配信登録要求信号を基地局制御装置 14 に転送する。基地局制御装置 14 は、受信された配信登録要求信号をサポート装置 15 に転送する。その結果、サポート装置 15 は、配信登録要求信号を受信する（ステップ X1）。

【0095】サポート装置 15 は、配信登録要求信号を送信してきた基地局制御装置 14 が、当該移動局 11 に対して移動前にマルチキャストパケットを配信していた基地局制御装置 14 と異なるか否かを判別する（ステップ X2）。異なれば（ステップ X2 の NO）、サポート装置 15 は、当該移動局 11 に対して移動元の基地局 13 から配信していたマルチキャストパケットと同一種類のマルチキャストパケットの配信要求であるか否かを判別する（ステップ X3）。同一種類のマルチキャストパケットである場合、サポート装置 15 は、回線確保のために加入者線延長制御を実行する（ステップ X4）。

【0096】具体的には、サポート装置 15 は、移動先の基地局制御装置 14 に対して移動元の基地局制御装置



14との間に回線を接続することを要求する。また、サポート装置15は、移動元の基地局制御装置14に対しても移動先の基地局制御装置14との間に回線を接続することを要求する。サポート装置15から回線接続を要求された2つの基地局制御装置14は、この要求に従って回線を相互に確立する。こうして、加入者線延長による回線接続が達成される。

【0097】一方、配信登録要求を送信してきた基地局制御装置14が移動前にマルチキャストパケットを配信していた基地局制御装置14と同じ場合（ステップX2のNO）、および、移動局11から要求されたマルチキャストパケットが同一種類のものでない場合、サポート装置15は、通常のハンドオーバを実行する。すなわち、移動局11と移動先の基地局13との間にチャンネルを設定するとともに、移動局11と移動元の基地局との間に設定されていたチャンネルを解放させる。

【0098】このようにこの実施形態6によれば、回線接続を加入者線延長により行っているから、単なるハンドオーバによる回線の設定および解放を行う場合と異なり、セル間移動時においてパケットロスを防止することができる。したがって、移動局11は、マルチキャストパケットを連続的に受信することができる。そのため、移動局11は、高品質な配信データを受信できる。ゆえに、システム効率が向上された移動データ通信システムを提供することができる。

【0099】実施の形態7、図11および図12は、この発明の実施形態7に係る移動通信システムが適用される移動データ通信システムにおける送信電力制御処理を説明するためのフローチャートである。なお、以下の説明では、図1を同時に参照する。

【0100】移動局11は、配信登録していても、配信が不要となる場合がある。これは、ユーザの意志によって決定されるものであるが、この場合、配信登録抹消要求を必ずしも行うとは限らない。配信登録が抹消されないまま配信不要な移動局11に対してマルチキャストパケットを配信し続けるのは、無駄であり非効率である。そこで、この実施形態7においては、地上装置12側が、配信登録している移動局11に対して配信の必要性の有無を周期的に確認するようにしている。

【0101】さらに詳述すれば、サポート装置15は、質問信号を基地局制御装置14に周期的に送信する（図11のステップY1）。質問信号は、配信登録テーブル15aに登録されている移動局11に対して配信の必要性の有無を確認するためのものである。基地局制御装置14は、質問信号を受信すると、この質問信号を基地局13に転送する（ステップY2）。このとき、基地局制御装置14は、質問信号とともに、電力測定要求信号を基地局13に送信する（ステップY2）。電力測定要求信号は、基地局13において質問信号に対する応答信号が受信されたときの電力の測定を要求するものである。

【0102】基地局13は、質問信号および電力測定要求信号を受信すると、この受信された2つの信号のうち質問信号をセル内の各移動局11に対して送信する（ステップY3）。移動局11は、質問信号を受信すると、質問信号に対する応答である応答信号を基地局13に送信する（ステップY4）。

【0103】基地局13は、応答信号を受信すると、従前に基地局制御装置14から送信されていた受信電力測定信号に基づいて、受信された応答信号の電力を測定する（ステップY5）。基地局13は、電力測定後、当該測定電力値を応答信号に付加し、この応答信号を基地局制御装置14に送信する（ステップY5）。

【0104】基地局制御装置14は、基地局13から送信された応答信号を受信する。その後、基地局制御装置14は、応答信号がどの種類のマルチキャストパケットに対する質問信号に対するものであるかを判別する（ステップY6）。

【0105】上述のように、質問信号は周期的に送信される。したがって、同じ種類のマルチキャストパケットに対する応答信号を常にサポート装置15に対して返信する必要はなく、1つの種類のマルチキャストパケットに対する応答信号は、一度だけで十分である。そのため、上述のような判別処理を行っている。

【0106】従前に受信した種類のマルチキャストパケットに対する応答信号であれば（ステップY6のYES）、基地局制御装置14は、応答信号をサポート装置15に送信しない。一方、初めて受信した種類のマルチキャストパケットに対する応答信号であれば（ステップY6のNO）、基地局制御装置14は、応答信号をサポート装置15に送信する（ステップY7）。

【0107】サポート装置15は、応答信号を受信すると、その応答内容に応じて、配信登録テーブル15aの配信登録状況を更新する。具体的には、配信の必要があるとの応答信号の場合には、サポート装置15は、当該移動局11の登録を維持する。配信の必要がないとの応答信号の場合には、サポート装置15は、配信登録テーブル15aから当該移動局の登録を消去する。

【0108】基地局制御装置14は、また、応答信号に含まれる受信電力値を各基地局13ごとに蓄積する（図12のステップY8）。基地局制御装置14は、接続されているすべての基地局13から応答信号を受信したか否かを判別する（ステップY9）。すべての基地局13から応答信号を受信すれば、基地局制御装置14は、すべての受信電力値のうち最低受信電力値を認識する（ステップY10）。

【0109】その後、基地局制御装置14は、最低受信電力値に基づいて、基地局13からマルチキャストパケットが送信される際の電力値を算出する（ステップY11）。具体的には、基地局制御装置14は、移動局11において十分な受信電力でマルチキャストパケットを受

信させる必要から、最低受信電力値が予め定める受信電力値となる送信電力値を算出する。

【0110】その後、基地局制御装置14は、この算出された送信電力値でマルチキャストパケットを配信するように、接続されているすべての基地局13に通知する(ステップY12)。この通知を受けた基地局13は、上記送信電力値でマルチキャストパケットを配信する。

【0111】このようにこの実施形態7によれば、基地局制御装置14は、配信の必要性の有無を確認する際に、基地局13における受信電力値を収集し、この収集された受信電力値のうち最低受信電力値に応じて基地局13の送信電力を制御している。したがって、基地局制御装置14の管轄エリア内に存在するすべての移動局11において、十分な受信電力でマルチキャストパケットを受信することができる。そのため、高品質なマルチキャストパケット伝送を実現することができる。ゆえに、システム効率が向上された移動データ通信システムを提供することができる。

【0112】他の実施形態。以上、この発明の7つの実施形態について説明してきた。しかし、この発明が他の実施形態を探り得るのはもちろんである。たとえば上記実施形態1ないし7においては、コネクションレス型パケット通信システムとしてIPパケット通信システムを適用する場合を例にとりて説明している。しかし、この発明は、CLNP(Connection-Less Network Protocol)型パケット通信システムなど他のコネクションレス型パケット通信システムに対しても容易に適用することができる。

#### 【0113】

【発明の効果】以上のようにこの発明によれば、コネクションレス型パケット通信システムにおけるマルチキャストパケット通信を移動通信システムに適用する場合、中継接続装置においてマルチキャストパケットを複製する。したがって、コネクションレス型パケット通信システム内においては、配信先移動局が複数存在しても、1つのマルチキャストパケットを伝送するだけで済む。しかも、ゲートウェイ装置と中継接続装置との間においても、1つのマルチキャストパケットを伝送するだけで済む。そのため、コネクションレス型パケット通信システム内でマルチキャストパケットを複製して伝送する場合に比べて、マルチキャストパケットを効率良く伝送することができる。ゆえに、システム効率を向上できる。

【0114】また、この発明によれば、セルおよび位置登録エリアなどの在圏エリアの変更を伴って移動する場合、移動局は、マルチキャストパケットの配信要求を位置登録要求またはハンドオーバー要求とともに制御チャネルを介して行うようにしている。したがって、パケット配信要求を通信チャネルを介して行う場合に比べて、マルチキャストパケットを移動局に対して迅速に伝送することができる。言い換えれば、移動局は、マルチキャスト

パケットを迅速に受信することができる。

【0115】より詳述すれば、パケット配信要求を通信チャネルを介して行う場合には、パケット伝送のために通信チャネルを使用できないから、パケット伝送を待機させる必要がある。しかし、パケット配信要求を通信チャネルではなく制御チャネルを介して行うことにより、パケット伝送をパケット配信要求を待たずに行うことができる。そのため、パケットを効率良く伝送することができ、また移動局においてはパケットを効率良く受信することができる。

【0116】さらに、この発明によれば、移動局が在圏セルの変更を伴って移動した場合、変更直後のセルを形成する基地局から所望のマルチキャストパケットが配信されていないときに限って、当該基地局に対して配信登録を要求する。すなわち、変更直後のセルを形成する基地局から自局が存在するグループのマルチキャストパケットが配信されているときには、そのマルチキャストパケットを受信することができる。したがって、移動局は、移動のたびに配信登録をしなくても、マルチキャストパケットを受信することができる。すなわち、移動局においては、配信登録要求の効率化を図ることができる。そのため、在圏セルを変更するたびに配信登録を要求する場合に比べて、移動通信システム内における無駄な信号処理を省略できる。ゆえに、信号処理の効率化が図られたシステムを提供することができる。

【0117】なお、移動通信システムにおいては、移動局が在圏セルの変更を伴って移動する場合、いわゆるハンドオーバー処理が行われる。基地局は、このハンドオーバー処理が実行されることにより、自局が形成するセルに移動局が新たに移動してきたことを知ることができる。

【0118】さらにまた、この発明によれば、配信を希望する移動局が存在するエリアを管轄する中継接続装置に対してのみマルチキャストパケットを配信する。したがって、ゲートウェイ装置は、配信不要な中継接続装置にまでマルチキャストパケットを伝送することはない。そのため、パケットの伝送効率を向上することができる。ゆえに、システム効率の向上を図ることができる。

【0119】さらに、この発明によれば、複数の移動局に対して共通に無線リソース情報を割り当てるから、1つの移動局に固有の無線リソース情報を割り当てる場合に比べて、無線リソースを有効利用することができる。したがって、システム効率の向上された移動通信システムを提供することができる。

【0120】さらにまた、この発明によれば、移動局が基地局制御装置の管轄エリアを変更した場合、加入者線延長制御により回線が確保される。したがって、移動局が通信中に管轄エリアを変更する場合であっても、回線接続状態が途切れることはない。そのため、移動局がマルチキャストパケットを受信している場合に管轄エリアを変更しても、パケットロスの発生を防止できる。ゆえ

に、通信品質の向上を図ることができる。

【0121】さらに、この発明によれば、基地局制御装置は、移動局のマルチキャストパケットの配信の要否を確認することができる。同時に、送信電力制御を行うことができる。したがって、移動局は十分な電力で電波を受信することができる。そのため、高品質な通信を実現できる。ゆえに、移動データ通信システムの効率向上を図ることができる。

#### 【図面の簡単な説明】

【図1】この発明の実施形態1に係る移動通信システムが適用される移動データ通信システムの構成を示すブロック図である。

【図2】サポート装置の処理を示すフローチャートである。

【図3】この発明の実施形態2に係る移動通信システムが適用される移動データ通信システムにおける移動局の配信登録要求処理を説明するためのフローチャートである。

【図4】ハンドオーバー要求信号の構造を示す概念図である。

【図5】この発明の実施形態3に係る移動通信システムが適用される移動データ通信システムにおける基地局制御装置の配信登録要求処理を説明するためのフローチャートである。

【図6】位置登録要求信号の構造を示す概念図である。

【図7】この発明の実施形態4に係る移動通信システムが適用される移動データ通信システムにおける移動局の配信登録要求処理について説明するためのフローチャートである。

トである。

【図8】報知情報信号の構造を示す概念図である。

【図9】この発明の実施形態5に係る移動通信システムが適用される移動データ通信システムにおけるサポート装置の配信登録時の処理を説明するためのフローチャートである。

【図10】この発明の実施形態6に係る移動通信システムが適用される移動データ通信システムにおけるサポート装置の配信登録時の処理を説明するためのフローチャートである。

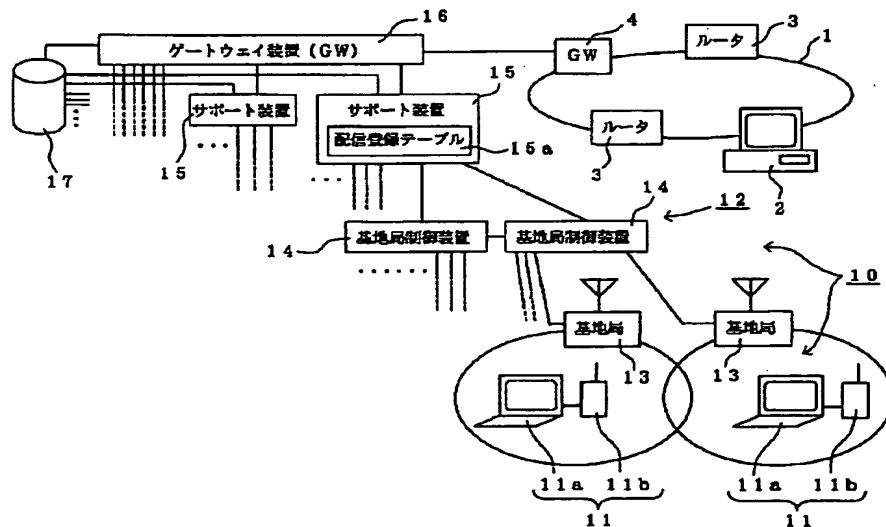
【図11】この発明の実施形態7に係る移動通信システムが適用される移動データ通信システムにおける送信電力制御処理を説明するためのフローチャートである。

【図12】この発明の実施形態7に係る移動通信システムが適用される移動データ通信システムにおける送信電力制御処理を説明するためのフローチャートであって、図11の続きの処理を示している。

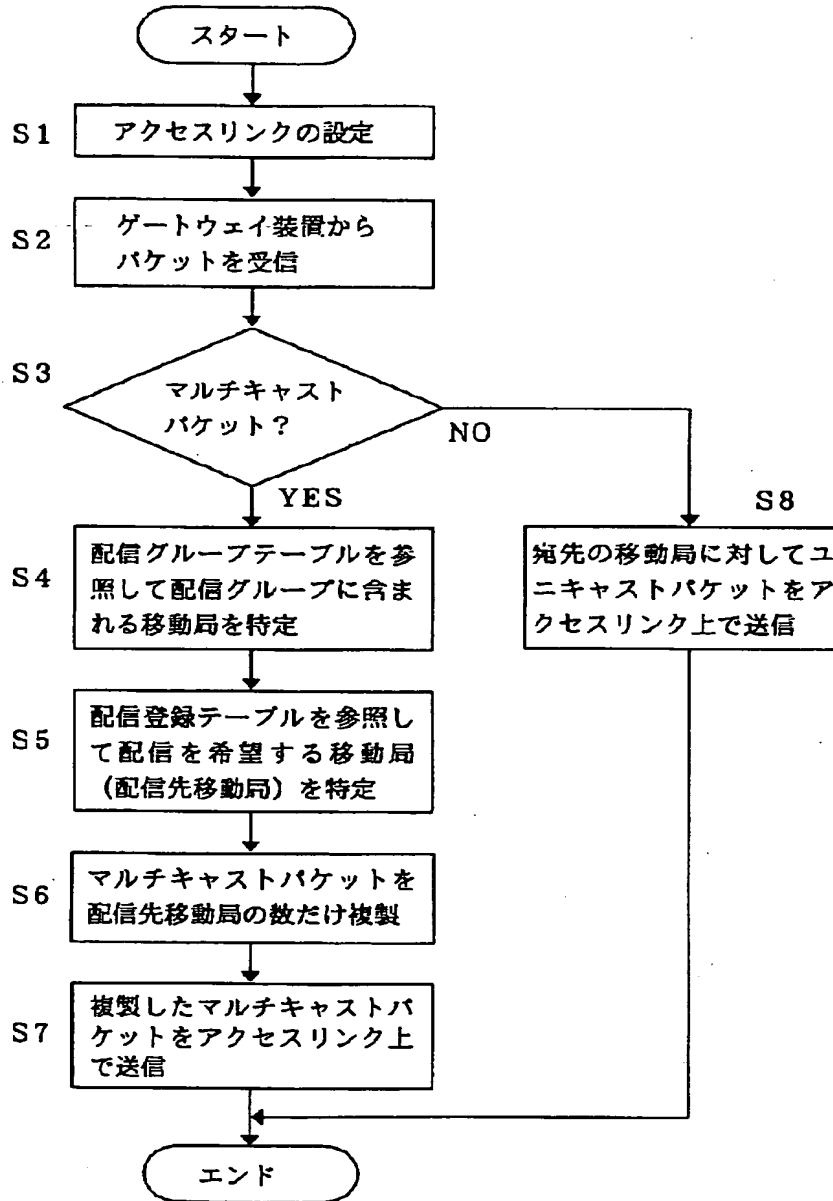
#### 【符号の説明】

- 1 IPパケット通信システム
- 2 IP端末
- 10 移動通信システム
- 11 移動局
- 12 地上装置
- 13 基地局
- 14 基地局制御装置
- 15 サポート装置
- 16 ゲートウェイ装置

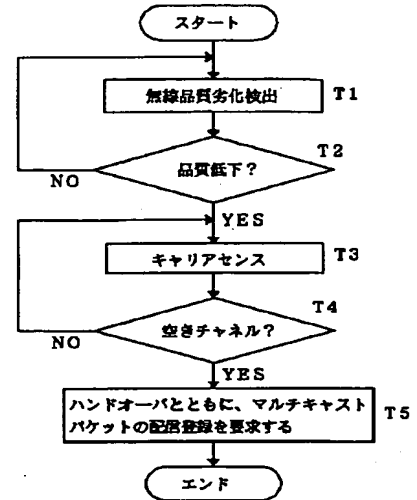
【図1】



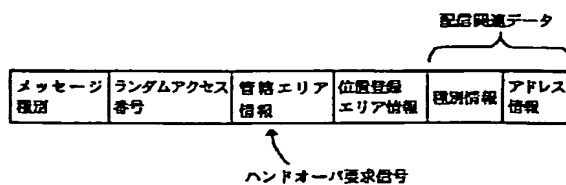
【図2】



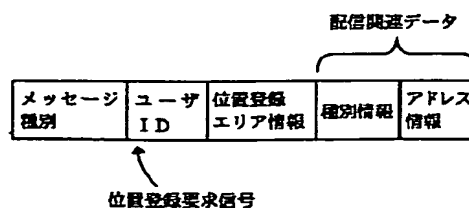
【図3】



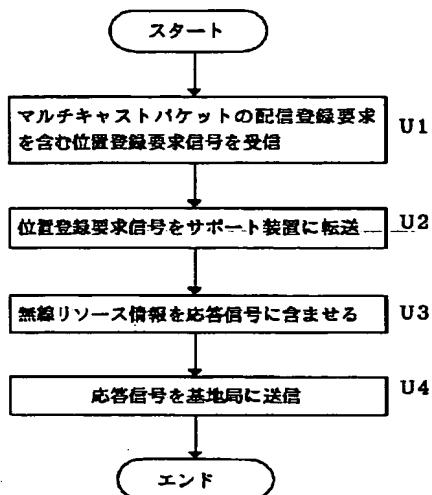
【図4】



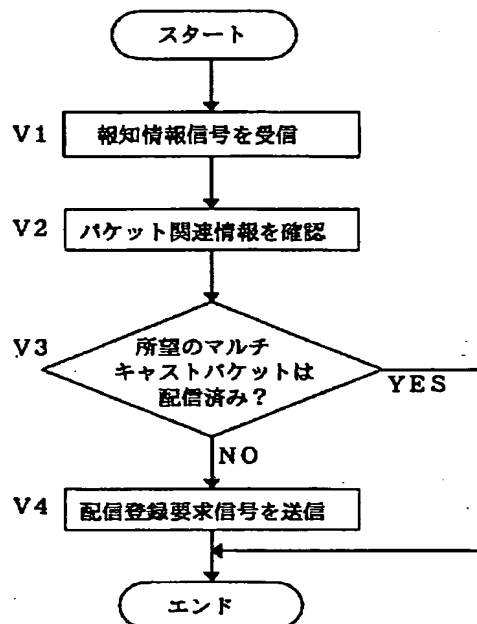
【図6】



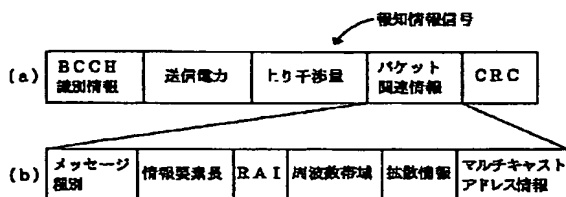
【図5】



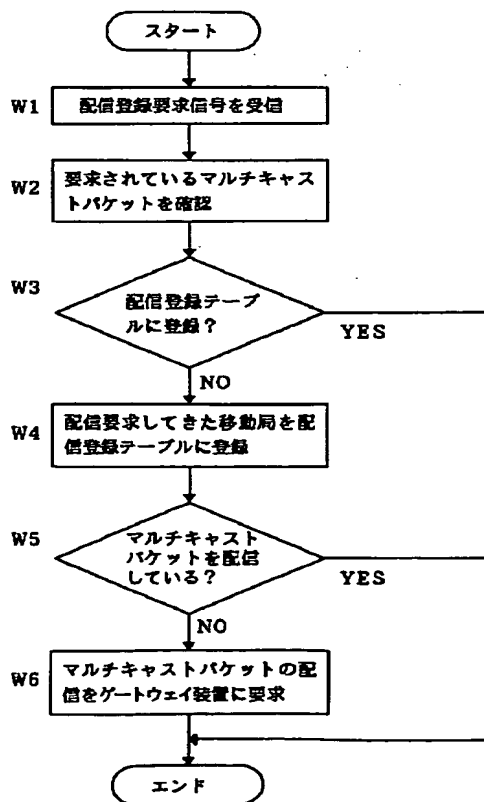
【図7】



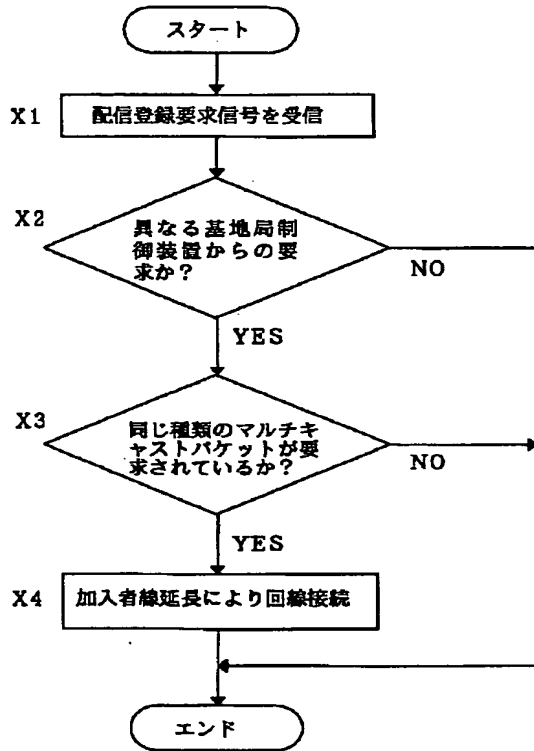
【図8】



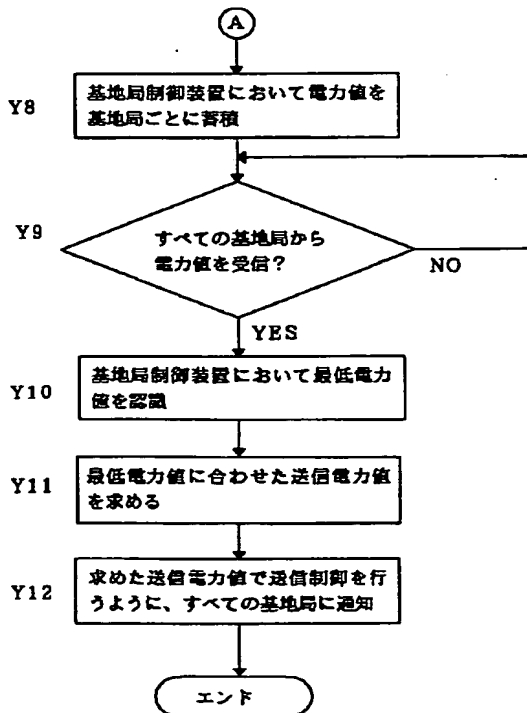
【図9】



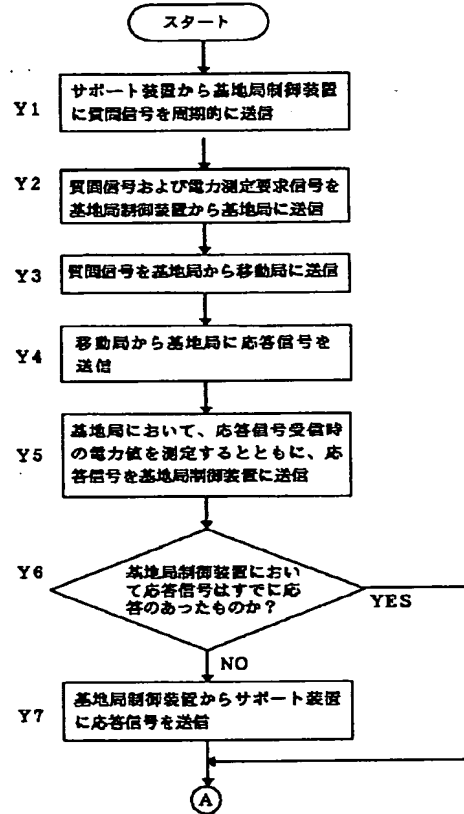
【図10】



【図12】



【図11】



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